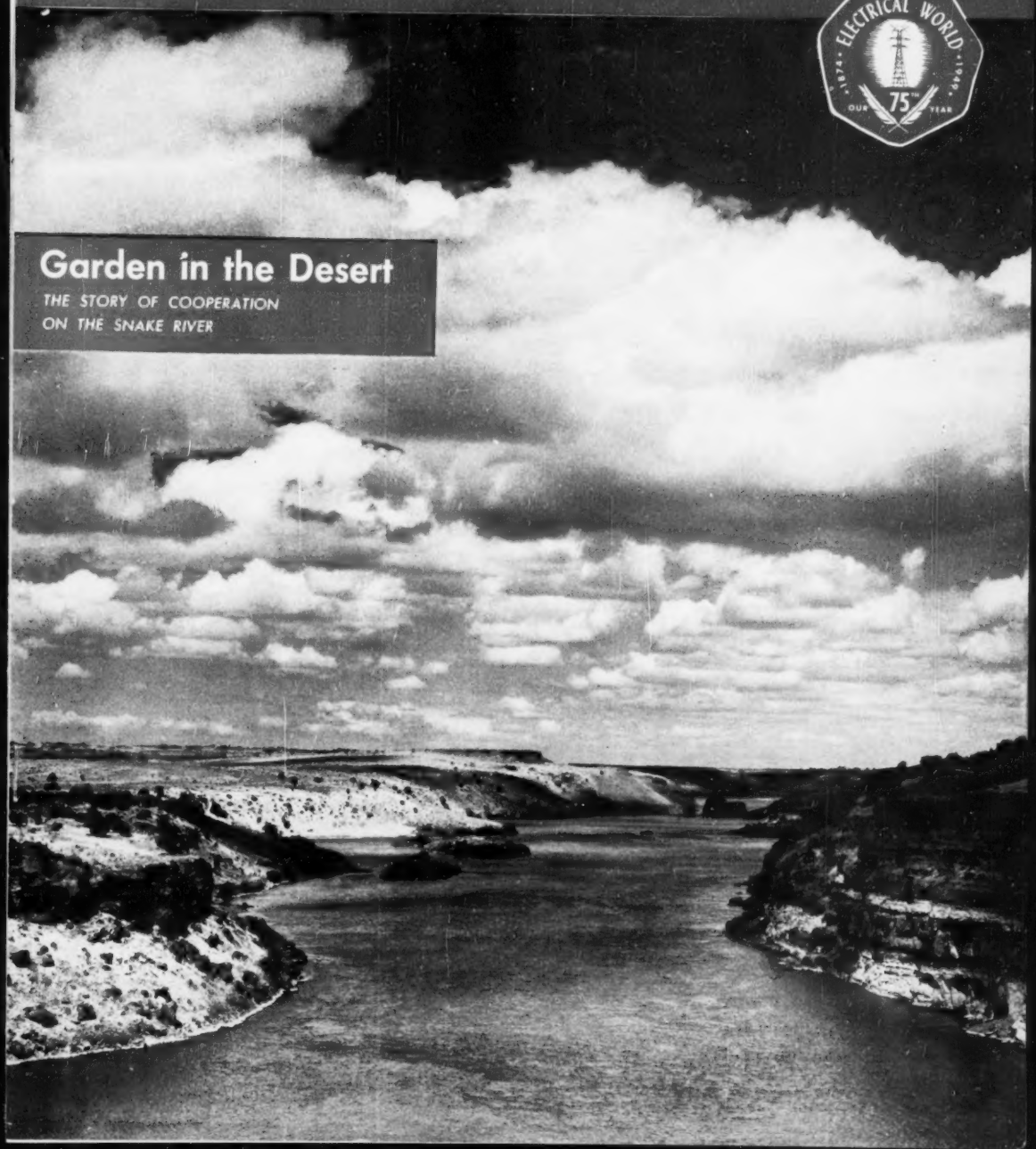
ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

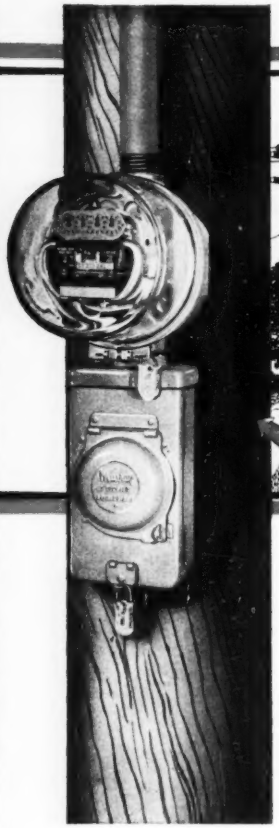
JANUARY 15, 1949

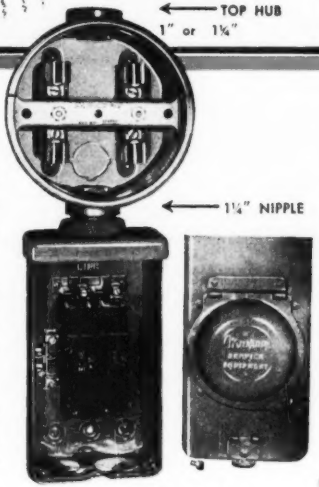
Garden in the Desert

THE STORY OF COOPERATION
ON THE SNAKE RIVER



NEW— Murray COMBINATION to CUT INSTALLATION COST!





Cat. Nos. 1962-35 or 1962-50

This new Murray Combined meter socket and yard pole breaker box answers the many requests for just such a labor and cost saving device.

The combination is staked at the factory, thereby eliminating the usual need for assembly and alignment. Installation on poles or walls is quick and simple.

A glance at the "High Spots" listed at the bottom, shows a few of the good reasons why it will be to your advantage to install the NEW Murray Combination Socket and Murray Magnetic Circuit Breaker Service Equipment.

SEND FOR BULLETIN No. 504

HIGH SPOTS

METER SOCKET

Deep-drawn aluminum case with integral weatherproof lip.

Turnproof watertight aluminum hub.

Reversible jaws, quickly adjustable for vertical or horizontal meter mounting.

Extra high dielectric strength. Independent laboratory tests demonstrated no 60-cycle flashover at less than 10,500 volts.

FACTORY STAKED NIPPLE

Joins meter socket and box into single rigid unit.

YARD POLE BREAKER BOX

Raintight deep-drawn seamless box.

A life-time weatherproof paint finish of Melamine Plastic base enamel.

MURRAY MAGNETIC CIRCUIT BREAKERS

No derating—will carry full rated load continually in direct sunlight and other exceptional conditions.

Instantaneous tripping under short circuit conditions.

Delayed tripping on light and medium overloads.

MURRAY MANUFACTURING CORPORATION . . . 1250 Atlantic Avenue, Brooklyn 16, New York

ELECTRICAL WORLD

Published for 75 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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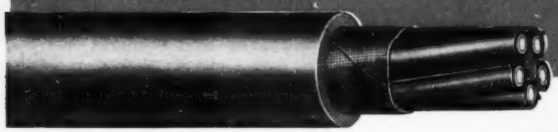
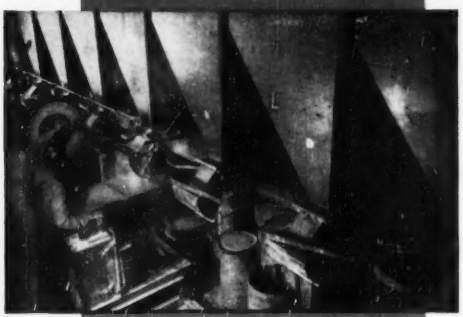
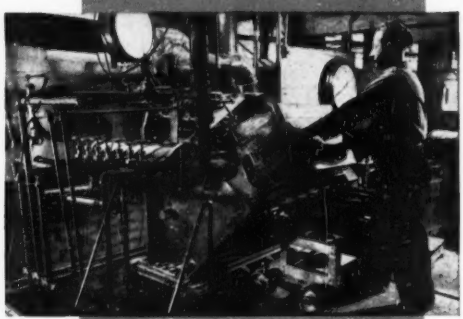
Okonite's basic formula for insulation forms basis for LONG CABLE LIFE



Up-River Fine Para Rubber



Balanced Mineral Ingredients



Mixed with 70 Years Experience

TODAY'S high installation and replacement costs tend to underscore the long term value of long-lived cable. And today, as always, no cable can be longer-lived than its insulation.

For 70 years, Okonite engineers have realized this. From the beginning they have adhered to the basic time-proved formula for Okonite rubber insulation. As a result, Okonite insulation remains the first choice of value-wise electrical engineers in the industrial, utility and transportation fields alike.

From the selection of the ingredients for the basic formula, through the processing and application of the finished insulation, the Okonite laboratories maintain close control at every step. For example, only natural rubber from the sturdy wild trees of the upper Amazon is permitted in the Okonite insulation. This is but one of the reasons for the long service records compiled by Okonite cables.

Note these typical examples of how Okonite insulation keeps its toughness and elasticity after long years in service:

Installation Conditions	Years In Service	Tensile Strength	Elongation 2" —
Honolulu, T. H. Communication Cable	32	1450	10.7"
New Haven, Conn. Substation Feeder Cable	30	1644	9.8"
New York, N. Y. Railroad Jumper Cable	24	1051	10.5"

If it's long-lived cable you want, specify Okonite time-tested rubber insulation as the basic component. And when you order an Okonite insulated cable, remember every length has been uniformly vulcanized in a continuous metal mold.

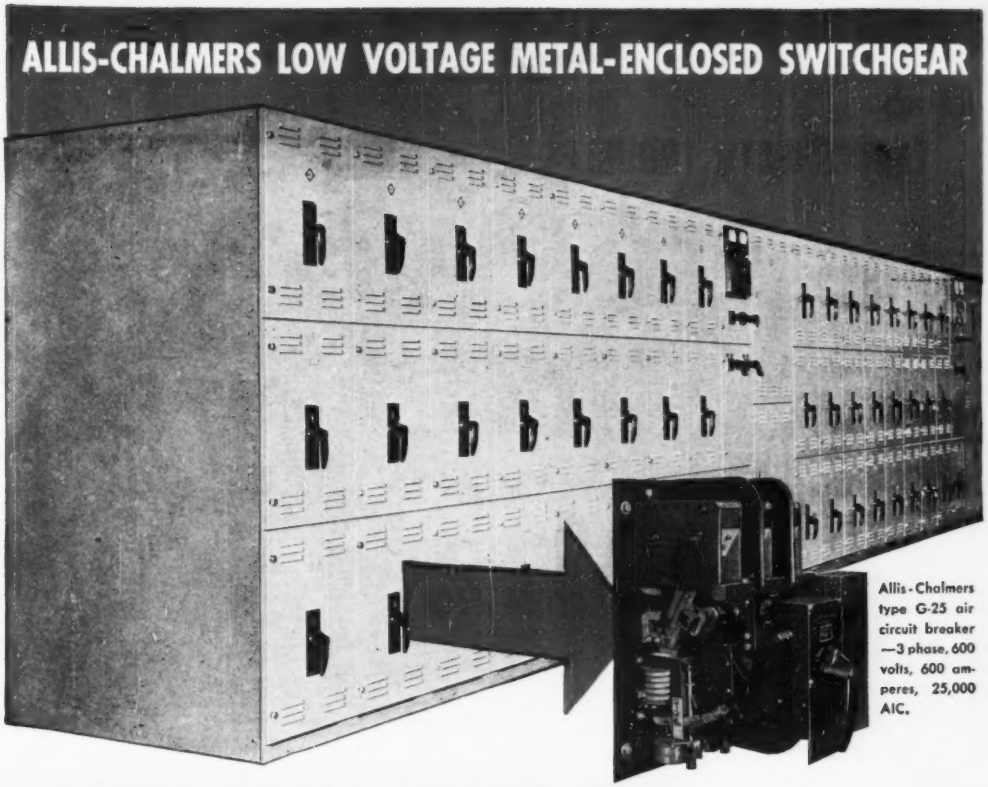
For further technical data, write for Research Publication EW-101. The Okonite Company, Passaic, New Jersey.

7211

OKONITE OKONITE SINCE 1878 insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY

ALLIS-CHALMERS LOW VOLTAGE METAL-ENCLOSED SWITCHGEAR



Allis-Chalmers type G-25 air circuit breaker —3 phase, 600 volts, 600 amperes, 25,000 AIC.

MODERN INSTALLATIONS NEED

Modern Protection!

NEW INSTALLATION DESIGN demands *modern* switchgear . . . inside and out! On both counts you can depend on Allis-Chalmers metal-enclosed low voltage units.

You Save on Installation

Low voltage units are factory assembled and completely wired for easy installation . . . just bolt them down, complete cable connections and put into operation. Maintenance is easier, too, because adjacent circuits need not be disturbed when inspecting drawout units. Simply replace the withdrawn breaker with a spare and the circuit is back in operation.

Dependable Interruption

Allis-Chalmers type G air circuit breakers are insensitive to shock and vibration under normal duty. Allis-Chalmers low voltage switchgear is available for 600 volts a-c and below where 15,000 to 100,000 amperes interrupting capacity is required.

For more details call your nearest A-C office or write direct.

A 2591

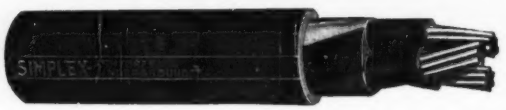
ALLIS-CHALMERS, 932A SO. 70 ST. MILWAUKEE, WIS.

ALLIS-CHALMERS

First in the U. S. with Metal-Clad Switchgear

AVOID LEAD SHEATH TROUBLES

WITH ANHYDREX CABLES



Here's an example of what can happen to lead sheaths on underground cables wherever stray currents, vibration and harmful soil acids prevail. And being underground, such damage can easily go unnoticed until important distribution systems go out of order. You must avoid this trouble at the very outset, and you can, by installing Simplex-ANHYDREX Cables.

ANHYDREX Cables can be buried directly in earth or be pulled into ducts, but they have **no** lead sheaths. They're not subject to electrolysis and crystallization and their tough neoprene jackets withstand exposure to soil acids, alkalies and abrasion. Their ANHYDREX insulation assures you of trouble-free service in wet locations. Even when constantly immersed in water it remains both physically and electrically stable.

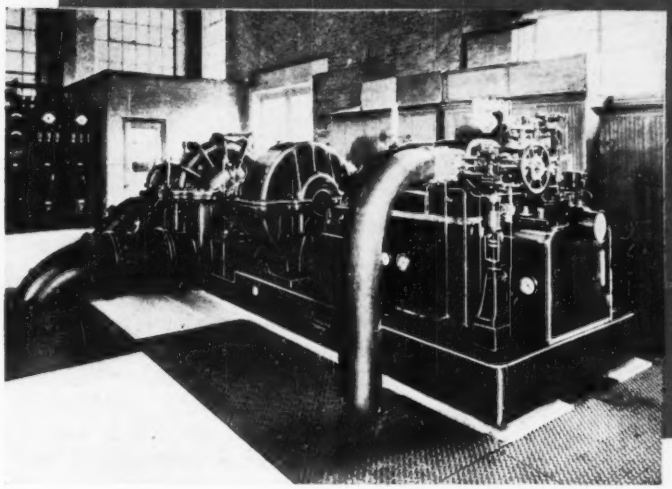
ANHYDREX Cables, too, are lighter in weight, easier to install. In fact, they can add in many ways to the efficiency and economy of transmission and distribution systems; communication, signal and control circuits; airport, street, and park lighting. Our booklet 985-A gives full details; write for it today.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

FULL PROTECTION for bearings and governors



Use the turbine oil that gives an extra margin of safety . . . Texaco Regal Oil (R&O)

AS TURBINES are "pushed" to meet today's power demands, operating conditions may change in a way to affect your turbine oil. But you can be sure of an extra margin of safety when you use *Texaco Regal Oils* (*R & O*). They inhibit both rust and oxidation, and have been specially processed to prevent foaming.

Texaco Regal Oils (*R & O*) free themselves rapidly of air and water, do not develop sludge. Thus, oil lines stay clear and bearing temperatures are kept normal by an uninterrupted flow of oil. Governor action remains instantly responsive. And, even under severest conditions, you'll get extra long oil service life.

Because they give extra protection, inhibited oils are recommended by turbine manufacturers. *Texaco Regal Oils* (*R & O*) meet the stringent requirements of all leading turbine builders . . . and the turbine oil specifications of the U. S. Navy.

Let a Texaco Lubrication Engineer help you operate turbines and other power plant machinery more efficiently and economically. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

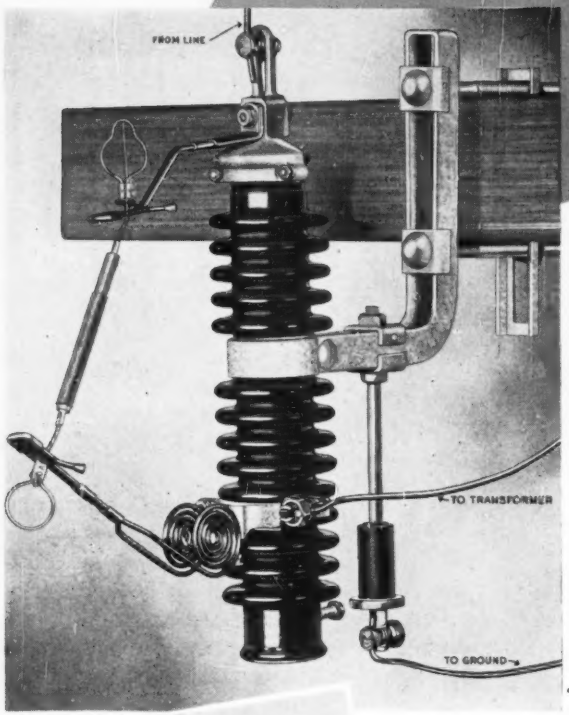
TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

Tune in...TEXACO STAR THEATRE presents MILTON BERLE every Wednesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

Now—A KEARNEY and Fuse Cutout

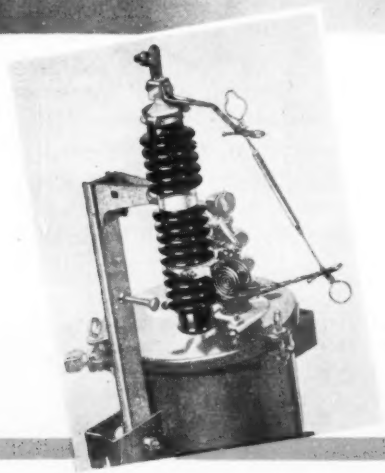


Advantages of TYPE QR DESIGN

1. **Relieves the high impact pressure of lightning discharge direct to the open air, *not* through various restricted passages as in old type arresters.**

2. **Relieves the extremely high melting temperatures that follow current arc because expulsion is direct to atmosphere.**

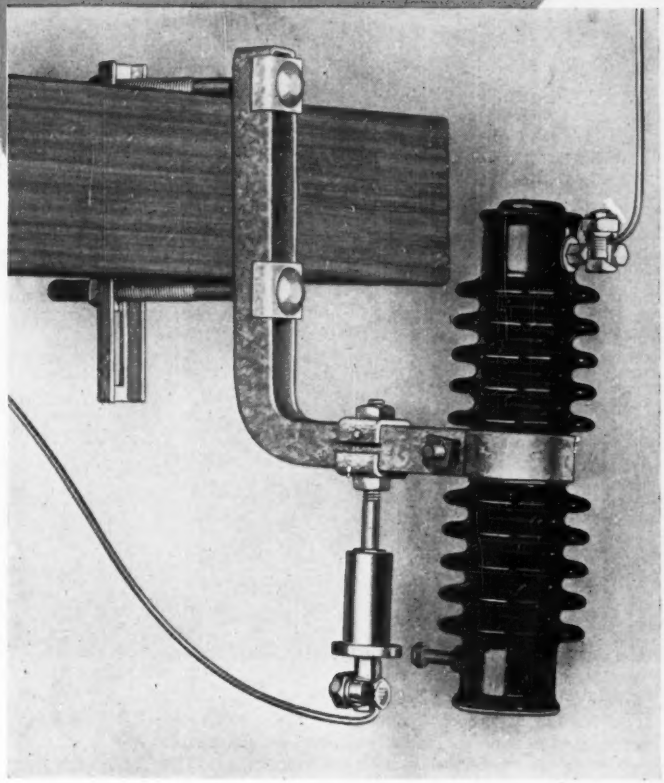
3. **Maintain correct calibration for the service life of the arrester through the use of ring busses, rather than point-to-point electrodes in the expulsion chamber.**



TYPE QRC COMBINATION TRIP-O-LINK AND LIGHTNING ARRESTER. This unit, because of its simplicity of design and low cost, is ideal for rural lines where construction and maintenance cost must be held to a minimum. Incorporating full lightning, overload and short-circuit protection all on one porcelain insulator. The crossarm or pole space is thereby conserved and the time required to install is greatly reduced.

QRC TRANSFORMER MOUNT. After attaching this unit to the transformer mounting bracket with a *single bolt* and connecting the lower switch terminal to the transformer terminal with a short piece of insulated wire, the unit is ready for operation. Compact, space saving, quick, easy installation.

Enclosed Lightning Arrester Built on One Insulator



KEARNEY TYPE QRE LIGHTNING ARRESTER.

Comprising all the improvements of the QR Series, this lightning arrester is designed with the double gap construction which completely eliminates "freezing" on lines and causing lockouts.

Write for Bulletin No. 10-18 for complete information and prices on the QR Series.

FOR BETTER CONSTRUCTION AND MAINTENANCE

Always Specify **KEARNEY PRODUCTS** *for the Job*

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

4224-42 CLAYTON AVE. – ST. LOUIS 10, MISSOURI

Canadian Plant, Guelph, Ontario

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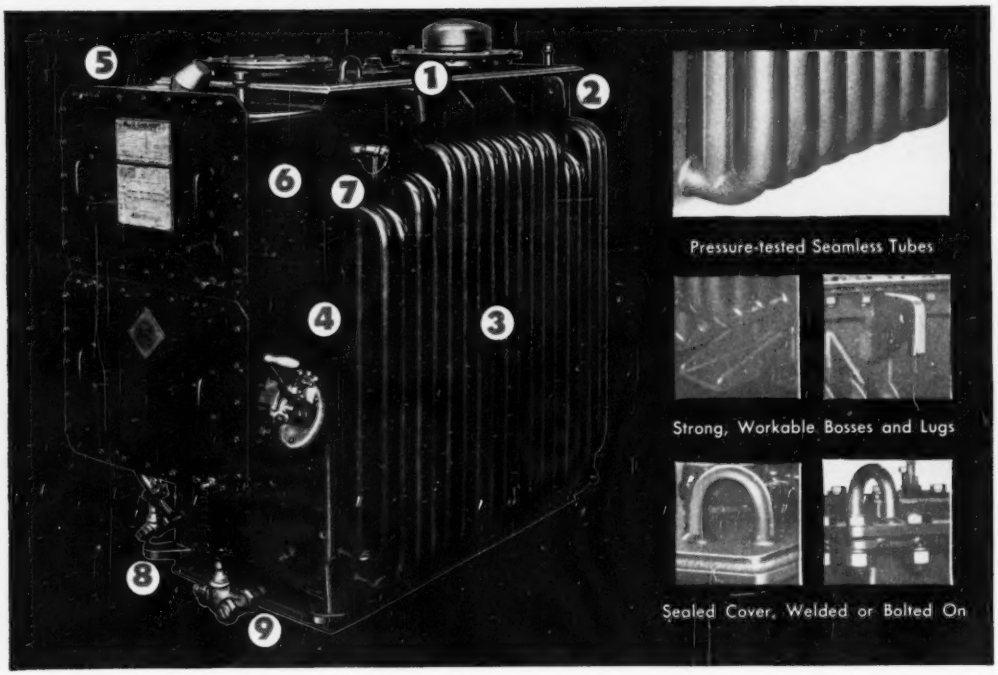
BEAT CORROSION! FLOODING! SUBMERSION!

With Allis-Chalmers Network Transformers



SERVING concentrated metropolitan loads, Network Transformers must operate dependably under the most adverse conditions.

These TANK CONSTRUCTION FEATURES show how Allis-Chalmers builds Network Transformers to combat corrosion, flooding, even complete submersion: —

1. Heavy tank cover (½" thick), welded or bolted on.
2. Guide angles on inside of tank wall provide positive positioning of core and coils.
3. Heavy gauge steel tank . . . seamless drawn radiating tubes. All nuts, bolts etc. galvanized.
4. Switch case and terminal chamber welded directly to main tank eliminates gasketed joint and reduces overall height.
5. Three coats of paint — each coat flow painted and baked on.
6. Seams and joints externally welded to eliminate crevices.
7. Tanks and cooling tubes are pressure tested far in excess of operating conditions.
8. Jack bosses free of obstructions for convenient lifting.
9. Design of base permits free rolling in any direction — provides for undertank ventilation.

For the *complete* story of A-C Network Transformers — including circular core and coil design, no-load tap changer, accessories etc. — contact your nearby district office. Or write for fact-packed 24 page bulletin 61B6152A. A 2601

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Network Transformers — Nearly 1,000,000 KVA Installed

New Beauty Treatment for Commercial Interiors!

LEADERALL

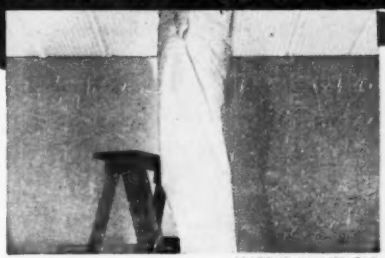
Illumination over all ...from wall to wall!

NEW FOR OLD!

A CEILING OF LIGHT ...AT ANY HEIGHT!

The new look for high-ceilinged rooms . . . A magic means of bringing high ceilings down to modern levels . . . and an economical means of "decorating" them, permanently, in the modern manner. (Leader tie-rods are adjustable and also are available in extreme lengths for long "drops.")

Completely LEVEL · Absolutely RIGID
NO OTHER OVERALL-TYPE FIXTURE CAN MAKE THIS CLAIM

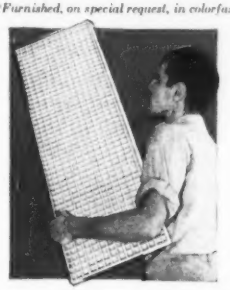


†PATENT APPLIED FOR

Only †LEADERALL brings you all these valuable features:

Reduces the cost of finishing new ceilings . . . Featherweight unit-frames . . . Translucent moulded plastic (fire-resistant) louvers permit many more apertures per foot for maximum "sifting" of lamp rays and greatest shielding of lamps (45° visual cut-off) . . . Insures highest quality of light for greater beauty and greater durability . . . Lightweight construction eliminates structural strains . . . Destaticized plastic louvers—dust-resistant, stay-white* plastic . . . Adjustable tie-rods . . . Units instantly removable for cleaning or for quick re-lamping . . . Complete rigidity—moulded units withstand rough handling by maintenance men.

*Furnished, on special request, in colorfast hues for color schemes.



Light LIGHT... all in *white!

The lightest weight over-all type fixture on the market, thanks to LEADER'S exclusive, one-piece *moulded translucent plastic louvers.* They are inflexible. Absolute uniformity, and more louvers per foot, achieving greater shielding of lamps, plus better diffusion of light, and no weight stress or strain on ceiling structure!

Leaderall LOUVERED LIGHT CEILING

A revolutionary application of fluorescent lighting—light by the square yard. An overall speedway of man-made sunbeams that speeds up worker efficiency. Calm, cool brilliance uninterrupted . . . A cheerful, May-morning sky throughout the year. Super-rich beauty, plus a new high in abundant light that's kind to eyes.

Send for mechanical details—today!

Leader Fluorescent Fixtures are sold and installed only by the better wholesalers and contractors.

LEADER ELECTRIC COMPANY

3500 N. KEDZIE AVENUE, CHICAGO 18, ILLINOIS

West Coast Factory: 2040 Livingston, Oakland 6, California

have we told you ENOUGH

ABOUT SEMI-CONDUCTING SHIELDED CABLE*?

FRANKLY, we don't know. As the inventor . . . and after years of operating experience, we know that it is the only practical and economical means of providing insulation with either internal or external shielding to:

1—Limit the effect of high voltage to the insulation proper.

2—Protect against shock hazard by providing a grounded exterior.

3—Prevent radiation of electrical disturbances from the cable.

4—Prohibit the development of electrical disturbances within the cable, which in themselves can be a source of trouble.

5—Better the performance of radar pulse cables, certain microphone cables and many high-voltage rubber-insulated cables.

BUT, we have the feeling that either:

A—We have not done the proper job of informing you how to handle or to utilize semi-conducting shielding.

or B—You have had difficulty in grasping the significance and realizing the many profitable uses to which it could be put.

We could obtain answers to our questions by employing more conventional methods, BUT . . . from the viewpoints of efficiency and economy . . . we are placing our questions before the best audience we know in order to guide future sales policies.

*Protected by patents 2,322,702 & 2,446,387 and variously identified as Type CB, Semicon and Type PS.

PLEASE HELP US . . . by checking the statements below and RETURNING your comments to us:

- ○ We have never heard of Semi-Conducting Shielding.
- ○ We have heard of it, but do not believe it has proved its worth.
- ○ We would like to learn more about this method of shielding.
- ○ We have not used it because . . .

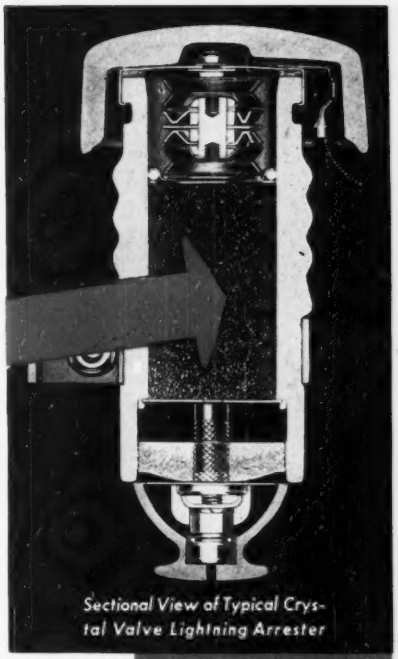
THOMAS F. PETERSON

1434 UNION COMMERCE BLDG. CLEVELAND 14, OHIO

OXIDIZED Silicon Carbide

TODAY'S MOST HIGHLY DEVELOPED VALVE ELEMENT

Used only and exclusively in Crystal Valve Lightning Arresters



Sectional View of Typical Crystal Valve Lightning Arrester

What It Is—Initially a specially processed type of electrical silicon carbide. After crushing, washing, sizing, etc., a special high-temperature chemical treatment provides each crystal with a *thin, porous coating* of silicon dioxide—SiO_2.

What It Does—Since it was developed exclusively for lightning arrester usage, its electrical characteristics, such as resistance and valve action, are especially adapted to lightning arrester operation. These provide Crystal Valve arresters with:

1. Low IR voltage drop and ample surge voltage reduction, with adequate surge energy absorption.
2. Heavy-duty surge discharge capacity.
3. Extremely marked valve action for follow current interruption.
4. Long life, since no measurable deterioration of Crystal Valve arresters occurs after years of normal service.

No material so far developed for the valve element of lightning arresters has advantages and characteristics as definitely outstanding as does Oxidized Silicon Carbide grain; it is because of this, plus our experience of more than 50 years in the lightning arrester field, that Crystal Valves embody in such marked degree the desirable features of valve type lightning arresters and have therefore afforded such superior protection to equipment and service.

Where arrester performance must be critical and exacting; where it must be depended upon absolutely—the Crystal Valve is definitely indicated.

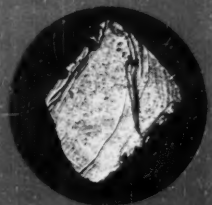
ELECTRIC SERVICE MANUFACTURING CO.

17th AND CAMBRIA STREETS, PHILADELPHIA 32

Branch Offices or Distributors in Principal Cities and Foreign Countries

Stocks Located at Strategic Points for Quick Delivery

Sectioned Silicon Carbide Crystal—a specially processed type of silicon carbide used only and exclusively in discrete form, for the valve element of Crystal Valve lightning arresters.



Typical Silicon Carbide Crystal used for many years both in discrete and bonded forms as the material generally used for the valve element in lightning arresters.

CRYSTAL VALVE LIGHTNING ARRESTERS

One Unit! One Order! One Responsibility!

That's How Easy . . . How Sure . . . it is when you use FWD's simple BUILT-TO-CODE Chart to select the Right FWD Truck for your Specific Needs

JUST imagine the time you save . . . the trouble you by-pass when you select a *built-to-code* unit for line construction or maintenance work with the help of FWD's handy code chart.

You quickly see the 38 varying — yet standardized — combinations that are available and the specific equipment each FWD carries.

You easily order the FWD you want because each unit is designated by an individual code number.

You issue only one order because FWD engineers and builds the *complete* unit — truck and equipment. That's why — when your FWD is delivered — it's ready to go to work immediately.

What's more — with FWD supplying the complete unit — buck-passing is eliminated. FWD accepts full responsibility.

Let FWD's code chart help simplify your equipment purchases. See your Graybar distributor or write us direct.

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN
Canadian Factory: KITCHENER, ONTARIO

Built-to-Code

MOTORIZED UNITS

FOR LINE CONSTRUCTION AND MAINTENANCE

Built By

Makers of America's Foremost Heavy Duty Truck

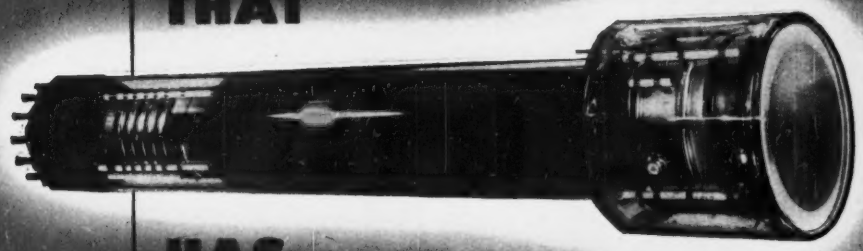
Distributed by GraybaR

THE TUBE THAT HAS DONE MOST FOR TELEVISION HAS 95%

NICHROME* V

METAL PARTS

The 5655 has three sections: (1) Image, (2) Scanning, (3) Multiplier. The image section contains a semi-transparent photocathode on the inside of the face plate, and on this the scene televised is focused by an optical lens system. This causes the photocathode to emit a stream of electrons from each illuminated area (proportional to the light striking the area), and these are focused on one side of the "target" where they produce a charge pattern. The opposite side of the target is scanned by a low-velocity electron beam from an electron gun in the scanning section. Electrons from the gun are turned back at the target forming a return beam which has been amplitude modulated by deposition of the electrons at the target, in accord with the charge pattern whose more positive areas correspond to highlights of the televised scene. In the multiplier section, the return beam is directed to a 5-stage amplifier (using secondary emission to amplify electron beam signals), and here the modulated beam is amplified at least 300 times—to drive the first stage of the video amplifier.



This is the RCA Image Orthicon 5655—super-sensitive eye of the television camera. Developed primarily for studio use and applications employing artificial illumination, it is several times more sensitive to light at low levels than the fastest motion picture film.

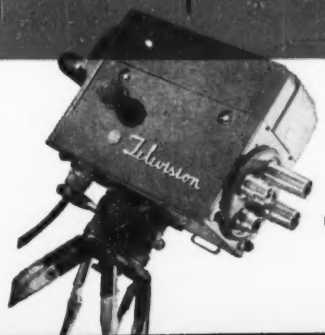
Only 15¼" long, it has over 150 precision-made parts, many assembled under microscopes.

These parts must remain unmagnetized by the strong magnetic fields of the focusing and deflection coils that surround the tube. Magnetized, they would produce fields of their own, and prevent proper operation.

When the parts are assembled, the glass housing of the tube is sealed. Temperature of the glass during sealing operations is raised to over 1000°F., temperature of the parts to as much as 900° F.

Under these conditions of manufacture, the alloy used must not only be entirely non-magnetic but possess high resistance to heat and oxidation. The only alloy that most satisfactorily meets these specifications is Nichrome V. *That is why 95% of the metal parts in the RCA Image Orthicon 5655 are made of Nichrome V.*

Driver-Harris manufactures over 45 alloys for the Electronic and Electrical fields. These are distinguished for giving exceptionally efficient, long and economical service—most particularly where requirements are unusually tough. So send us your specifications. As with the Image Orthicon, it is most probable a D-H alloy will best solve your manufacturing problems.



*Nichrome is manufactured only by

Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco, Seattle

Manufactured and sold in Canada by

The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

SPECIAL PURPOSE ALLOYS SINCE 1919 — TRADE MARK REG. U. S. PAT. OFF.

*T.M. Reg. U. S. Pat. Off.

Everybody's Pointing to HOTPOINT'S

It's The Hottest Advertising Story In Water Heater History... And Only Hotpoint Has It!

LOOK at the selling theme, look at the features and you'll say "No wonder Hotpoint is today's fastest-selling electric water heater!"

• **BACKED BY A** bang-up, year-'round advertising program, Hotpoint dealers everywhere are telling the story of amazing "Magic Circle Heat." Miniatures, cut-aways—all kinds of merchandising tools—help *demonstrate and sell* Hotpoint's famous Pressurized Calrod® Units, Automatic Thermostat, Fiberglas® insulation, 10-Year Protection Plan and many other features!

• **MAGIC CIRCLE HEAT** is one more reason why retailers everywhere are pointing to Hotpoint as the franchise with a future!

HOTPOINT INC. *(A General Electric Affiliate)*, CHICAGO

Magic Circle Heat

"Magic Circle Heat" skyrockets sales of America's largest-selling water heater in market after market.

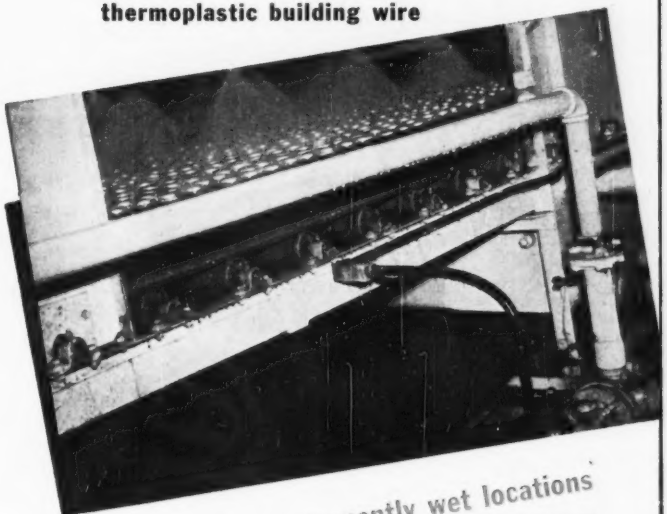
Everybody's Pointing To

Hotpoint

RANGES • REFRIGERATORS • WATER HEATERS • FREEZERS • DISHWASHERS • DISPOSALLS • SINKS
CABINETS • CLOTHES WASHERS • DRYERS • IRONERS

WHAT IT MEANS TO WIRE WITH TYPE TW

GENERAL ELECTRIC TYPE TW
The first . . . and foremost thermoplastic building wire



for wiring permanently wet locations

When "specs" call for a wire to be used in wet locations where moisture is likely within the raceway—underground or in concrete slabs . . . in masonry in direct contact with the earth—*the* wire to use is General Electric Type TW. This top-quality wire is underwriter-approved in sizes No. 14 to No. 0000 Awg for use in raceways in these wet locations, and in sizes No. 14 Awg to No. 2000 MCM for open wiring.

In addition to the flame- and moisture-resistant qualities of General Electric Type TW, it is also resistant to oils, acids, and alkalies.

So for those tough wiring jobs remember General Electric Type TW. It's easy to strip, easy to pull, clean to work with.

Send for free booklet

The new free booklet, *Building Wires, Cables, and Cords for every purpose* gives more detailed information on Type TW and the rest of the General Electric line. For your free copy address Section W19-127, Construction Materials Department, General Electric Company, Bridgeport 2, Conn.

GENERAL ELECTRIC

AROUND THE CIRCUIT WITH YOUR G-E MERCHANDISE DISTRIBUTOR

Was asked about BX the other day by a young fella just starting in the trade. I thought everybody knew all about **General Electric BX® armored cable**: that it was extremely flexible and easy to handle and that it goes in to last. When I checked my handbook, I found another feature I'd overlooked. In sizes 12 and 14, it's smaller and lighter in weight than ever before, with a special bonding strip to insure adequate ground.

Did you know that **service entrance cable** (Type SE—Style U) can be installed directly on the outside of a building without conduit? You can even paint the flame-retardant, moisture-resistant cotton braid if you want to. Another nice thing about this high-quality product is that, on short spans, you can run it from the pole right through to the meter equipment.

Had a call from Bill Brown for some information on the wiring of his new livestock barn. One of the requirements was that the cable had to withstand weather extremes, and fumes and corrosive vapors. I told him the General Electric people must have had him in mind when they designed **Super PVX® nonmetallic sheathed cable.** This top-quality cable is for those difficult jobs where easy installation and long service life under the worst conditions are important. Super PVX comes in ivory or brown color to give a trim, neat appearance on surface wiring jobs. Stop by for a sample.

WIRES AND CABLES

EVERYONE SAVES WITH *Pennsylvania*

STANDARD PARTS POWER TRANSFORMERS

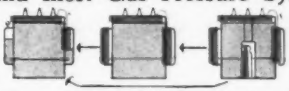
Lower Prices and Faster Deliveries For You

Economy in Manufacturing For Us

Pennsylvania Transformer Company introduces a line of Power Transformers that was carefully designed to include the desirable features of custom-built transformers, at quantity production prices. Streamlined and standardized methods of manufacture, coupled with the use of standard designs and standard parts, shorten engineering and production time. This reduces the price of the transformer and shortens the delivery time. Of special interest is the fact that these Standard Parts Transformers can be supplied with any of the popular methods of oil preservation.

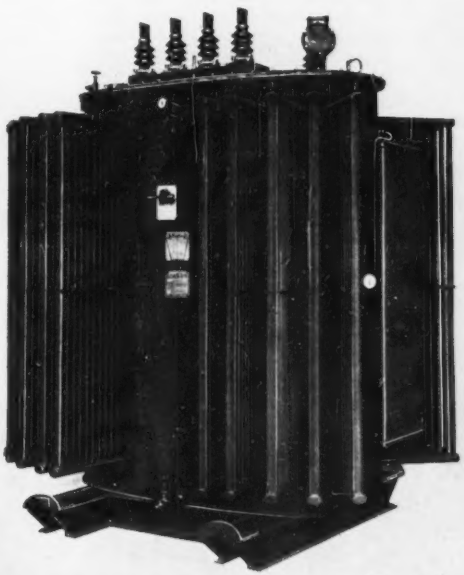
HERE IS HOW IT'S DONE:

We begin with a transformer that falls within the standard design ratings and add two auxiliary tanks. An auxiliary tank is welded to each end of the transformer tank. These auxiliary tanks are connected to each other and to the main tank by tubing, to form the following Oil Preservation Systems: Inert Gas-Oil Seal Sealed Tank and Inert Gas Pressure System. "Ingenious," you say! Well, we call it good engineering and functional design. For example, when the radiators are applied to the transformers, in most cases they extend beyond the auxiliary tanks, so the addition of these auxiliary tanks does not increase the projected floor area. Because these auxiliary tanks are permanently welded to the transformer tank, they offer no problems of installation and extra maintenance. But that's not all! All Standard Parts Power Transformer tanks, regardless of the type of oil preservation, are filled with the same quantity

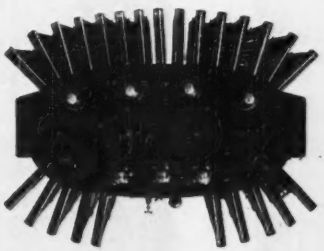
of oil, with the extra gas and oil spaces provided in the auxiliary tanks. Thus, bushings with standard (normal) length shanks are used on all Standard Parts Power Transformers, and no special-size bushings need be stocked. What is more, the unique construction permits the user to change the method of oil preservation without difficulty and without adding any parts. Sealed Tank can be changed to Inert Gas-Oil Seal; and Inert Gas Pressure System can be changed to Inert Gas-Oil Seal or Sealed Tank.  Pennsylvania Standard Parts Transformers can be provided with conventional Oil Expansion Tanks in which case the auxiliary tanks are left off. However, all the other advantages of the Standard Parts design are maintained. When called for, throats with horizontal side-wall bushings can be located on the ends of the transformer. In addition, extra compartments for potheads, disconnect switches, etc., can also be added to the Standard Parts Transformer.

These are just a few of the outstanding design features of Pennsylvania's entirely new Standard Parts Power Transformer. For more information write for Booklet No. 1492.

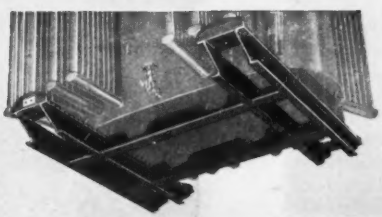
Now available in the following sizes:
Three Phase: Up to 10,000 Kva, 34 Kv.
Single Phase: Up to 5,000 Kva, 34 Kv.



Standard Parts Power Transformer. 3750 Kva, 3 Phase, 60 Cycles, OA, 55°C. Voltage: 12,000 Delta-4,160 Y.



Top of 4000 Kva Standard Parts Transformer. Note how auxiliary tanks fit into ends of the transformer and do not add to the length of the transformer.



Base for Standard Parts Transformer. Base is designed to simplify jacking, pulling, rolling, and painting.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

PITTSBURGH 12, PENNSYLVANIA

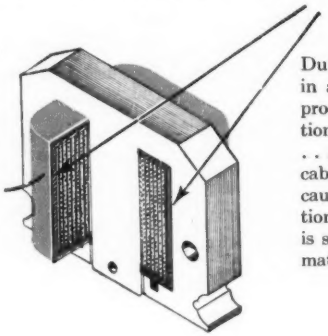
First all-new watt-hour meter in 50 years

GENERAL ELECTRIC CO. says: "The I-50 is the first all-new watt-hour meter in 50 years—new in conception, design, operation, and use of modern materials and techniques. It has greater sustained accuracy, longer life."

For greater insulation strength, reliability and secure positioning, the potential coil is molded to the electromagnet core with Du Pont polythene. This plastic combines high dielectric strength with low moisture-absorption.

employs Du Pont POLYTHENE

G. E.'s new potential coil stands about 15 kv under impulse, and 10 kv under 60-cycle breakdown. The polythene insulation stands up under humidity, sunlight and increased temperatures. It's non-corrosive, resists tracking (90 seconds minimum by ASTM test), permits better-insulated leads and neater mechanical design.



Du Pont polythene serves today in a myriad of better electrical products. Wire and cable insulation . . . insulating films and tapes . . . insulating discs for coaxial cables—those are just a few. Because of its remarkable combination of good properties, polythene is steadily replacing many other materials for electrical work.

for

extra-long life of potential coil

Look to polythene for improving *your* products! It's light, tough, strong; resists chemicals and moisture. It has high dielectric strength, a low power factor and is stable over years of service. Polythene molding powders are available in colors . . . may be injection- or compression-molded or extruded as sheeting, tubing or wire-covering.

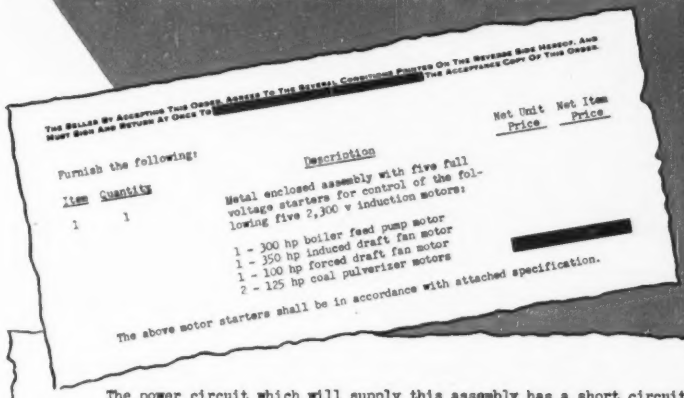
DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Write today for the facts on versatile Du Pont polythene! We'll send properties data plus data on how others have used it in making a host of improved products of many different types. Just write: E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 121, Arlington, N. J.

Tune in to Du Pont "Cavalcade of America" Monday nights—NBC coast to coast

Large Consulting Engineering Company

Selects EC&M Valimitor Starters



The Seller By Accepting This Order Agrees To The Several Conditions Printed On The Reverse Side Hereof, And Must Sign And Return At Once To [redacted] The Acceptance Copy Of This Order.

Item	Quantity	Description	Net Unit Price	Net Item Price
1	1	Metal enclosed assembly with five full voltage starters for control of the following five 2,300 v induction motors:		
		1 - 300 hp boiler feed pump motor		
		1 - 350 hp induced draft fan motor		
		1 - 100 hp forced draft fan motor		
		2 - 125 hp coal pulverizer motors	[redacted]	

Furnish the following:

The above motor starters shall be in accordance with attached specification.

The power circuit which will supply this assembly has a short circuit capability of 300,000 kva at 2,300 volts, and the units shall be suitable for operation under these conditions.

For Application Having Short Circuit Capability of 300,000 KVA

Proof of acceptance of EC&M VALIMITOR Motor Starters is shown by the above order issued by the consulting engineering firm handling a new power plant extension.

EC&M VALIMITOR Starters cost about the same as standard starters equipped with auxiliary protective devices having only limited interrupting capacity . . . but the VALIMITOR Starter gives *unlimited* protection. There is *no ceiling* on VALIMITOR protection . . . the design of EC&M VALIMITOR Starters is based on safely interrupting a faulted motor circuit even if supplied from a bus of infinite KVA. And there's nothing to replace after a fault — just press the "start" button to re-start.

Be safe with EC&M VALIMITOR Starters for 2300-4600 volt motor drives. No need to worry about the starter you select today being outmoded by an increase in available KVA tomorrow. To secure *unlimited* protection at one cost, simply send us the name-plate data of your motors. EC&M VALIMITOR Starters give permament, all-time protection.

ONLY EC&M VALIMITOR STARTERS GIVE ALL THESE FEATURES--

1. SHORT CIRCUIT Protection— regardless of available KVA.
2. OVERLOAD Protection.
3. LOW VOLTAGE Protection.
4. CUSHIONED STARTING — gives a smoother start and lower inrush current — improving starting conditions — may save cost of more expensive reduced voltage starter.
5. NO REPLACEMENTS to restart, after a fault.

MAXIMUM RATINGS

Squirrel-cage, Synchronous or Wound-rotor Motors.

2300 volts		4600 volts
600 HP	60 cycles	600 HP
300 HP	25 cycles	250 HP

For Complete Coverage At All Times... Switch to EC&M Valimitor Motor Starters

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Experience of 30-Odd Years in Production of UTILITY BODIES

Type B-4—features 4-man crew compartment in body . . . used by power, light, and communications utilities.

We build utility truck bodies on an assembly line basis. In this field, we are the largest exclusive manufacturers of standard utilities equipment for motor vehicles.

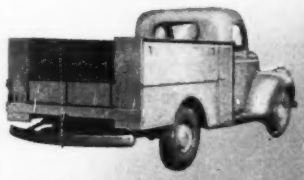
The American line includes several different types of bodies — line construction, light line service, general service and meter installation, utility, crew compartment, maintenance, installation, signal lighting maintenance, street lighting, and others.

If you have an idea on bodies for your particular fleet, chances are we already have a body for your requirements, or with a few minor changes in one of our bodies can give you what you need — on a production basis.

We can serve you with what you need to help you serve others.

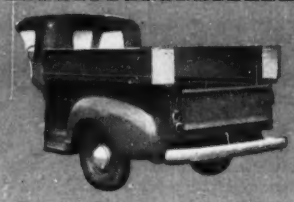
Type DPL and DT Line Construction bodies are the standard design for power, light, and communicating utilities.

American Tower Lift — Provides working heights of better than 50 feet. Used in line construction work, street lighting, signal maintenance, tree trimming, and many other types of work. Two models—heavy duty and light duty.



Type 4460—Universal for all types of service work — electric, gas, etc., appliances, meters, plumbers, etc.

Surveyor — An example of an American specialized body. The Surveyor is used for carrying surveying crews and equipment.



Type 4804—Ready-made, lock tight compartments provide generous carrying space for tools and diversified equipment items.

American Revolving Aerial Ladder — American also makes the Seagrave revolving ladder, either manually or hydraulically operated.

THE American COACH & BODY COMPANY

MAIN OFFICE AND PLANT — 9503 WOODLAND AVE., CLEVELAND 4, OHIO

CALIFORNIA DIVISION — 432 FIFTH STREET, OAKLAND 7, CALIFORNIA

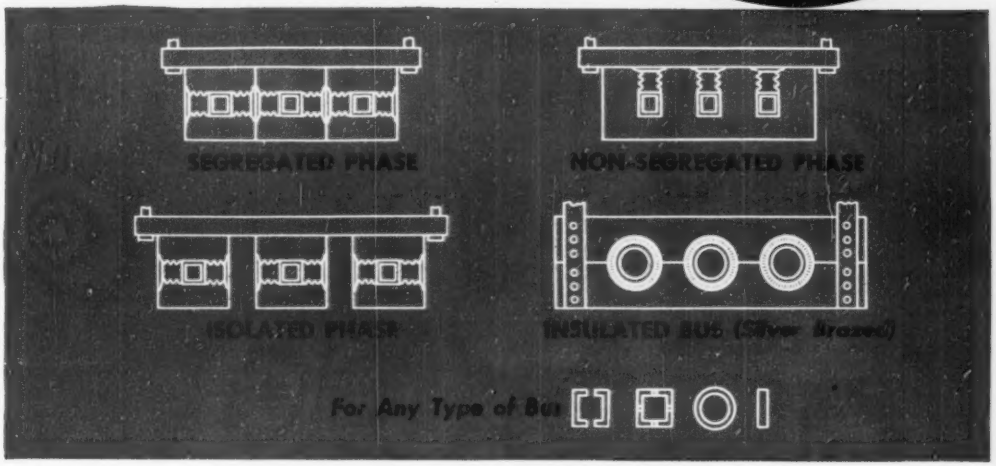
SALES OFFICES: INSURANCE EXCHANGE BLDG., DES MOINES 9, IA. · 207 LAKE STREET, MONROE, N. Y. · HEALEY BLDG., ATLANTA, GA.

DISTRIBUTORS: BAKER EQUIPMENT ENGINEERING CO., SUMMIT & NORFOLK STS., RICHMOND 11, VA. · EQUIPMENT SERVICE, INC., 1 WAWARME AVE., HARTFORD 6, CONN.

ACB and

A TYPE OF ELPECO "UNITIZED" BUS RUN

To Fit Every Need



Advantages of *"UNITIZED"* Bus Run

DESIGNED AS A UNIT TO FIT YOUR JOB

Each Elpeco Unitized Bus Run is factory designed as an electrical and mechanical unit to fit the requirements of the individual job. Phase to phase clearance, phase to ground clearance, insulation impulse level, and mechanical stresses caused by short circuit are equal to or greater than the associated apparatus.

FACTORY ASSEMBLED AS A UNIT

Assembly at the factory by skilled men with engineering supervision avoids field assembly mistakes and cut and try methods.

FACTORY TESTED AS A UNIT

Mechanical test assures correct dimensions to meet specifications, also adequate mechanical strength of the unit. Electrical test made for impulse level and short circuit strength of the unit.

SHIPPED AS A UNIT COMPLETELY ASSEMBLED

Elpeco unitized bus run is shipped completely assembled. Where unusual dimensions are encountered, the bus run is divided into convenient size for shipment.

BIG SAVINGS IN INSTALLATION TIME

Simple installation of completely assembled unit eliminates field assembly of parts, gives big savings of installation time and cost.

WEATHERTIGHT

Suitable gasketing of the bus run excludes rain, dust and dirt. Installation can be outdoors without the construction of any special enclosure permitting further savings in building cost.

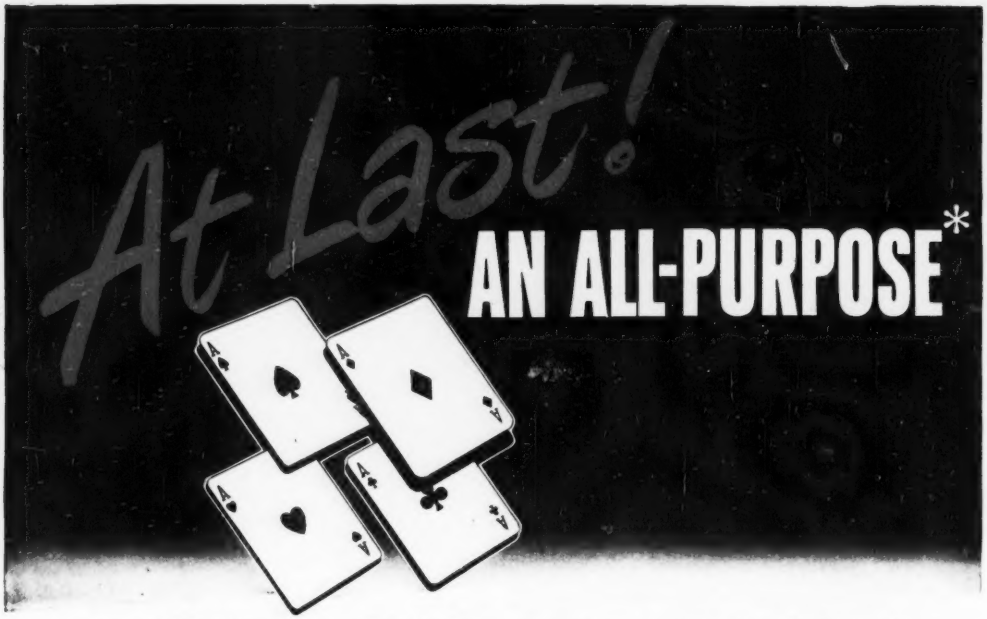
METALCLAD FOR OPERATING SAFETY

Bus run enclosures protect against accidental contact with buses by operating personnel.

INSPECTION SIMPLIFIED

Rectangular enclosures with easily removable flat covers or hinged doors make inspection easy.

ELECTRIC POWER EQUIPMENT CORP.
412 North 18th St., Philadelphia 30, Pa.



Here at last is a dependable, economical insulating varnish that gives outstanding results in all applications except high speed armatures. It's General Electric's new 9574—with characteristics which make it ideal for a wide range of insulating applications. Look at the remarkable features it combines!

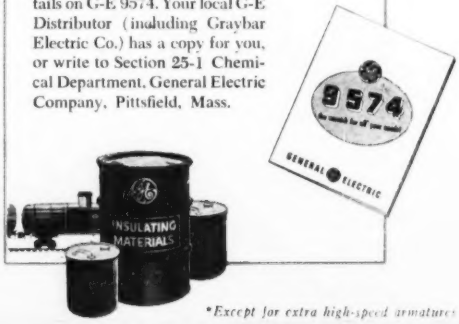
Used for Every Type of Winding A simple cure develops excellent physical and electrical characteristics in G-E 9574. That's why it has so many applications. It is particularly suited for repair work. It can be used on every type of winding, including enamel, cotton, asbestos, glass, and Formex.

Easier to Work G-E 9574 is a phenolic drying-oil varnish. Especially easy to use and handle, yet it gives maximum protection as a general-purpose insulation. It has an unusually high flash point of 100 F. And its viscosity of 250 C. P. average (at 45 F) makes G-E 9574 usable at barrel gravity. But you can thin it up to 20% with petroleum spirits.

Cures at Lower Temperature This clear-baking varnish cures at a much lower temperature than most synthetics having similar properties. A baking cycle as low as 212 F is successful in conventional equipment. G-E 9574 lends itself readily to infra-red baking. It sets up into a tough, pliable mass even in the deepest coils. Aging properties are excellent.

FIND OUT MORE

New bulletin gives you full details on G-E 9574. Your local G-E Distributor (including Graybar Electric Co.) has a copy for you, or write to Section 25-1 Chemical Department, General Electric Company, Pittsfield, Mass.



*Except for extra high-speed armatures

You Can Put Your Confidence in

GENERAL ELECTRIC

ELECTRICAL EQUIPMENT IS NO BETTER THAN ITS INSULATION

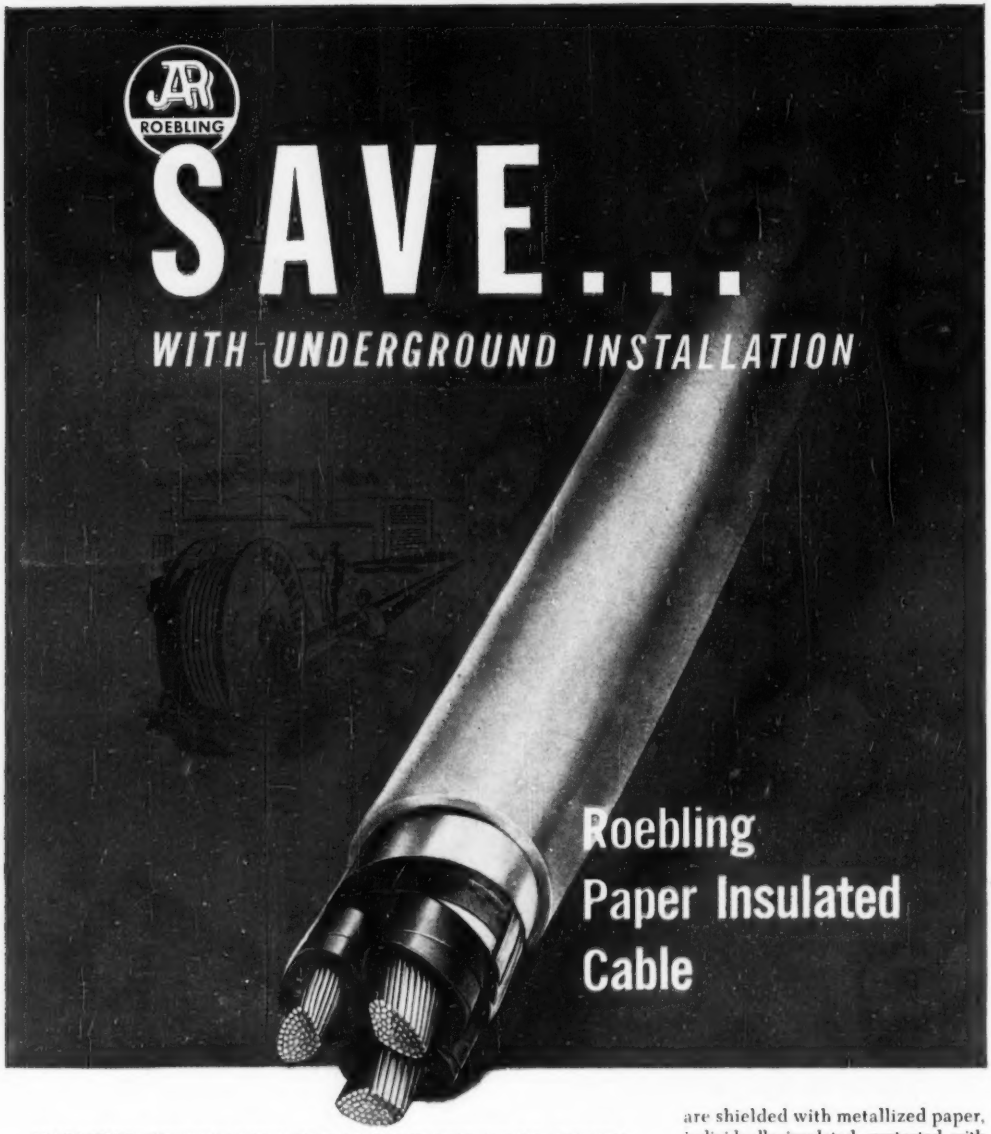
INSULATING VARNISH!
G.E.'s new 9574
ELECTRICAL
Characteristics of
G-E Varnish No. 9574
Dielectric
. . . 1800-2
Dielectric strength, after 24
hours' immersion in water at
25C, volts/mil . . . 700
MECHANICAL
Characteristics of
G-E Varnish No. 9574
Build relative . . . . . Excellent
Adhesion . . . . . Excellent
Toughness . . . . . Excellent
Hardness . . . . . Excellent
Flexibility . . . . . Excellent
Penetration . . . . . Excellent
Bonding . . . . . Excellent
High-temp. bonding . Excellent
CHEMICAL
Resistance of
G-E Varnish No. 9574
Water . . . . . Excellent
Acid . . . . . Excellent
Alkali . . . . . Excellent
Oil . . . . . Excellent
Salt water . . . . . Excellent
USE
G-E 9574 is exceptionally
easy to use and handle. And
it cures at a much lower tem-
perature than most synthetic
having similar properties.

ELECTRICAL EQUIPMENT IS NO BETTER THAN ITS INSULATION

JAR ROEBLING

SAVE...

WITH UNDERGROUND INSTALLATION



YOU WIN WHEN YOU ABOLISH OVERHEAD LINES

YOU'VE EVERYTHING TO GAIN and nothing to lose (except costly maintenance and eyesores) when you abolish overhead lines. Today's best practice is to put circuits underground . . . and to install Roebling Paper Insulated Lead Encased Cables for long, uninterrupted service at lowest cost.

Roebling Shielded Type H is outstanding for 3-phase grounded neutral circuits from 13 to 33 kv. It comes in both single and multiple conductor construction, in regular and Compack strand (round or sector). Conductors are shielded with metallized paper, individually insulated, protected with perforated copper shielding tape, and then the whole assembly served with a bronze binder tape and lead sheathed.

Your nearest Roebling office and sales engineer will be glad to help you choose the *right* cable for your specific service. John A. Roebling's Sons Company, Trenton 2, New Jersey.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

Atlanta, 934 Avon Ave. ★ ***Boston,*** 51 Sleeper St. ★ ***Chicago,*** 5525 W. Roosevelt Rd. ★ ***Cleveland,*** 701 St. Clair Ave., N. E. ★ ***Denver,*** 1635 17th St. ★ ***Houston,*** 6216 Navigation Blvd. ★ ***Los Angeles,*** 216 S. Alameda St. ★ ***New York,*** 19 Rector St. ★ ***Philadelphia,*** 12 S. 12th St. ★ ***Pittsburgh,*** 855 W. North Ave. ★ ***Portland, Ore.,*** 1032 N. W. 14th Ave. ★ ***San Francisco,*** 1740 17th St. ★ ***Seattle,*** 900 First Ave.

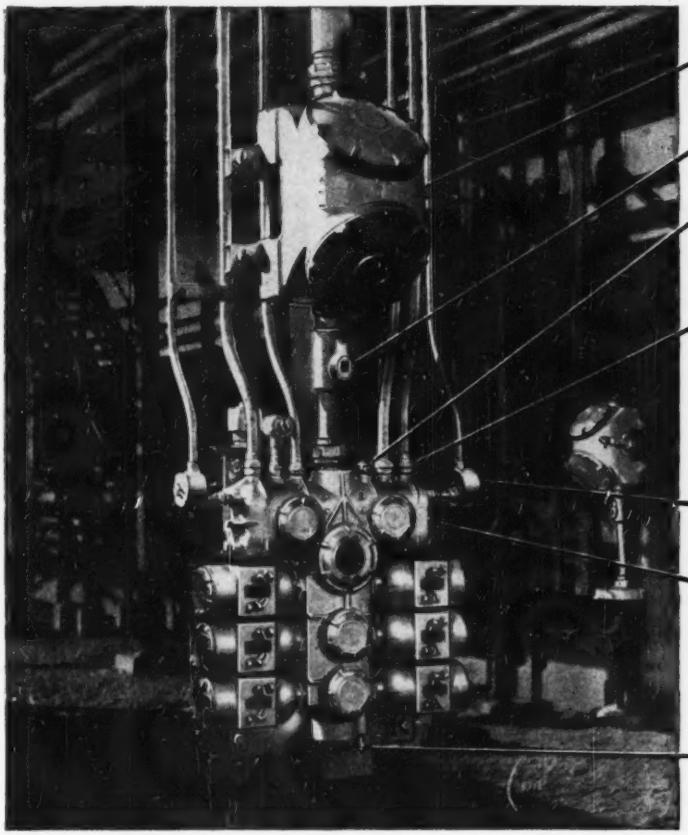
ROEBLING

☆ ***A CENTURY OF CONFIDENCE*** ☆

Explosion-Proof
CONDULETS

afford **maximum safety** from explosion and fire

(CONDULETS are made only by CROUSE-HINDS)


Type FLB Explosion-Proof Circuit Breaker Condulet protecting the main lighting feeder
Type EYS Sealing Condulet
Type ECD Breather Valve and Type ECD Drain (shown at bottom of panelboard) ventilate and drain the main wiring compartment
Type UNY Explosion-Proof Union
Type GUAB Explosion-Proof Junction Condulet
Type EDP Explosion-Proof 12-Circuit Lighting Panelboard
Type ECD Drain

Locations where flammable atmospheres are likely to be present are designated as hazardous by the National Electrical Code. The Code requires explosion-proof electrical installations in such locations. Crouse-Hinds Company manufactures hundreds of explosion-proof CONDULETS, lighting fixtures, plug receptacles, and other equipment that affords maximum safety by preventing explosion and fire.

They are described in Crouse-Hinds Condulet Catalog 2509. Write for a copy.

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
Syracuse 1, N. Y., U.S.A.

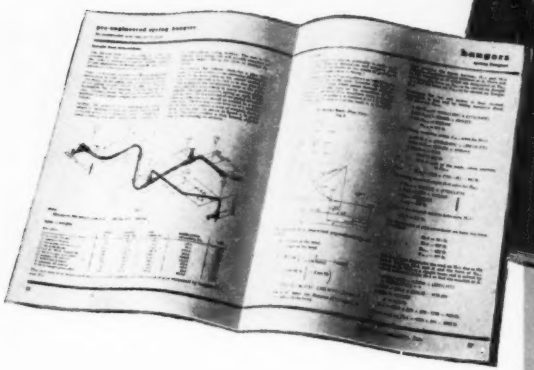
Offices: Birmingham – Boston – Buffalo – Chicago – Cincinnati – Cleveland – Dallas – Denver – Detroit – Houston – Indianapolis – Kansas City – Los Angeles – Milwaukee – Minneapolis New York – Philadelphia – Pittsburgh – Portland, Ore. – San Francisco – Seattle – St. Louis – Washington. *Resident Representatives:* Albany – Atlanta – Charlotte – New Orleans – Richmond, Va. CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

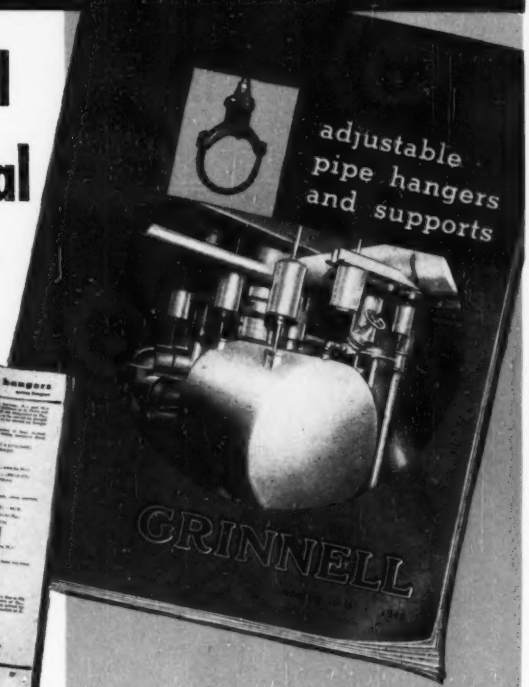
CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

You'd pay real money for this book!

The NEW Grinnell Pipe Hanger Manual

. . . and comprehensive catalog 10-D





FIRST TIME . . . in one 92-page book every pipe hanger, part and accessory, with full instructions for easy selection and correct specification.

Grinnell engineers worked for months to put into one orderly, completely illustrated book everything you need to write hanger specifications precisely. It's a complete catalog of Grinnell Pipe Hangers and Supports and a comprehensive manual . . . all in one. It's worth money to you but it doesn't cost you a penny. Write for your copy today. Grinnell Company, Inc., Providence 1, R. I.

- ★ Maximum recommended load rating for each hanger at various temperatures with minimum safety factor of 5
- ★ How to make load calculations for spring hangers, step by step, with drawings
- ★ Constant support or variable spring hangers may be selected and specified from simple load tables
- ★ Method of calculating take-out and determining hanger rod lengths . . . schematic drawings and formulas
- ★ Standard specifications with tables of maximum spacing between pipe supports, load carrying capacity of steel hanger rod, also rod size as determined by pipe size for fire protection work
- ★ A complete line of cast and malleable hangers ranging from the simplest plumbing or heating installation to the most complicated power plant installation

99 YEARS
PIPING

GRINNELL

NOW—A Better Ground Rod because It's Blackburn-Built!

BLACKBURN *Copper-Clad* GROUND ROD

Completely Covered, Molecularly Bonded, to Insure Dependable, Permanent Grounding

Check these 6 Features

1 **A stronger, more rigid rod for better driving.** Made with stronger, stiffer steel core, having a higher carbon content than any other rod.

2 **Completely covered, including top and bottom, to fully protect steel core.** Has a heavy, non-porous and uniform covering of pure copper, which is thoroughly bonded to the steel core, and will not peel off when driven.

3 **Rolled finish produces hard, scar-resistant surface.**

4 **Fully approved by REA.**

5 **Now available for prompt delivery.** Made in sizes ½ x 8, ½ x 10, ⅝ x 8, ⅝ x 10, ¾ x 10.

6 **Backed by Blackburn's reputation for quality.**

BUILDERS OF QUALITY PRODUCTS FOR 15 YEARS

Note uniform copper covering, molecularly bonded to steel. Cross section of copper is greater than No. 4 wire.

Jasper Blackburn Products Corp.
First, Madison and Clinton Sts.
ST. LOUIS 6, MISSOURI

Mail Coupon Now for Sample Section

JASPER BLACKBURN PRODUCTS CORP.,
First, Madison & Clinton Sts. • St. Louis 6, Mo.

Send me, without obligation, a sample section of your Blackburn Copper-Clad Ground Rod, prices, and name of nearest jobber.

*Individual Name & Title*_____

*Firm Name*_____

*Address*_____

FW

PENELEC'S Kilowatts

AT WARREN, PA. STATION

Carefully Protected by

R&IE

Metal Enclosed, Isolated Phase
BUS STRUCTURES

Originated by R & I E in 1936

Provides RELIABILITY, FLEXIBILITY, SAFETY

1. PHASES individually isolated and enclosed eliminating costly building and cell construction. Sealed dust-proof covers with bolted seams. Any section of cover can be opened for inspection.
2. SUPPORT RINGS equalize all stresses. Channel shaped for high strength. May be mounted any position.
3. INSULATION—Porcelain, always in compression—conductor shock-proof, longitudinally and radially.
4. INSULATOR ADJUSTMENT—threaded stud with locking nut and washer.

Above is shown a portion of the 11.5 KV. Isolated Phase Transformer leads installed for Pennsylvania Electric Co. at Warren, Pa.
Check all these advantages of isolated Phase, Metal Enclosed Bus Structures against cable runs or cell structures. Then call in an R&IE, or an I-T-E engineer who can discuss details for your installation.

I-T-E

R&IE

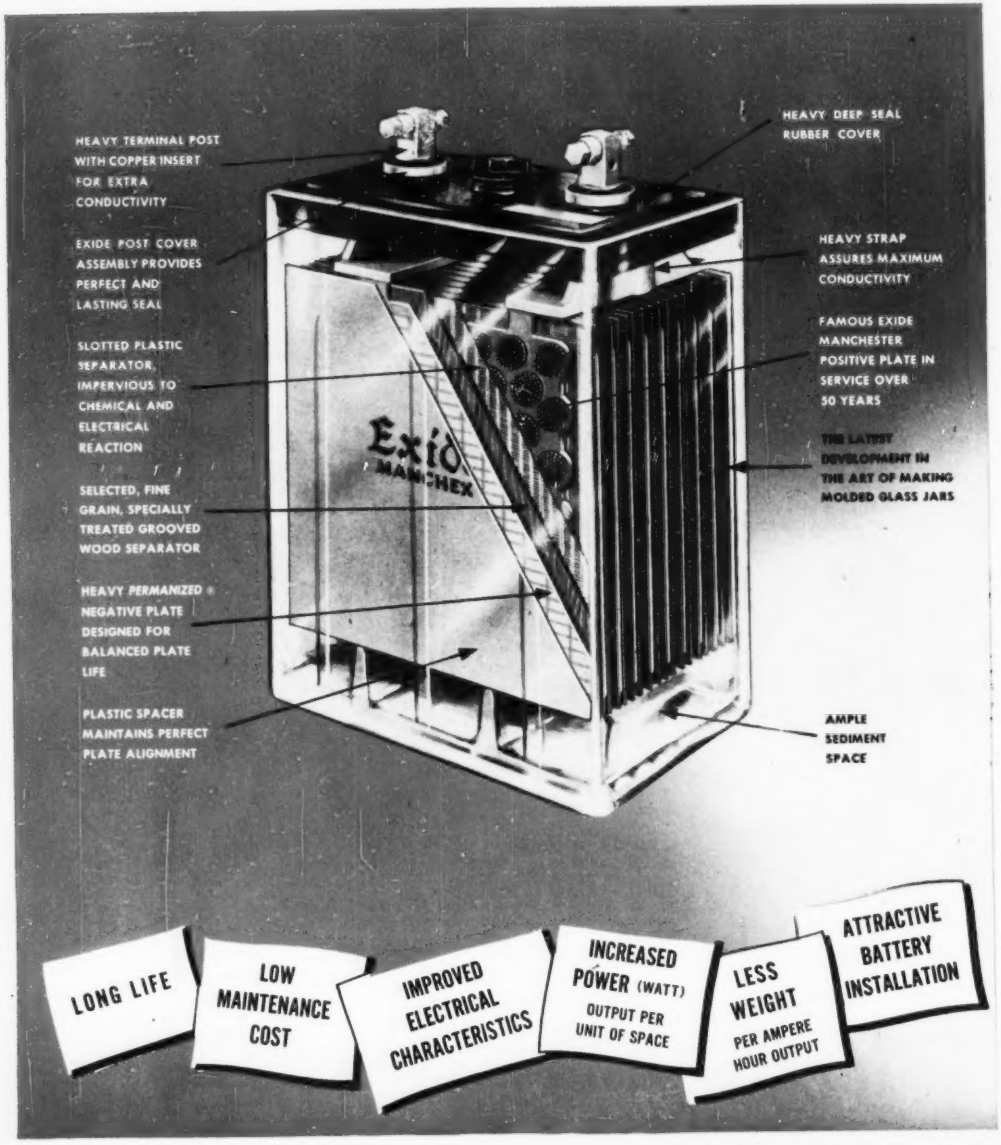
RAILWAY and INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

AFFILIATED WITH THE I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.
IN CANADA — EASTERN POWER DEVICES LIMITED, TORONTO

The Check List

- CONDUCTOR SUPPORT CLAMPS AND FITTING
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC RECLOSING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

NEW...


HEAVY TERMINAL POST WITH COPPER INSERT FOR EXTRA CONDUCTIVITY
EXIDE POST COVER ASSEMBLY PROVIDES PERFECT AND LASTING SEAL
SLOTTED PLASTIC SEPARATOR, IMPERVIOUS TO CHEMICAL AND ELECTRICAL REACTION
SELECTED, FINE GRAIN, SPECIALLY TREATED GROOVED WOOD SEPARATOR
HEAVY PERMANIZED NEGATIVE PLATE DESIGNED FOR BALANCED PLATE LIFE
PLASTIC SPACER MAINTAINS PERFECT PLATE ALIGNMENT
HEAVY DEEP SEAL RUBBER COVER
HEAVY STRAP ASSURES MAXIMUM CONDUCTIVITY
FAMOUS EXIDE MANCHESTER POSITIVE PLATE IN SERVICE OVER 50 YEARS
THE LATEST DEVELOPMENT IN THE ART OF MAKING MOLDED GLASS JARS
AMPLE SEDIMENT SPACE
Exide
MANCHEX
LONG LIFE
LOW MAINTENANCE COST
IMPROVED ELECTRICAL CHARACTERISTICS
INCREASED POWER (WATT) OUTPUT PER UNIT OF SPACE
LESS WEIGHT PER AMPERE HOUR OUTPUT
ATTRACTIVE BATTERY INSTALLATION

the EXIDE-MANCHEX battery

Technical data about this Exide development

Ten years in the making, the advent of the Exide-Manchex Battery is based on two things—the desire to use materials to greater advantage and provide a battery that would be more efficient with greater life.

After years of research and rigorous testing, the following combination of major items that make up a storage battery was selected for use in the new Exide-Manchex.

THE MANCHESTER POSITIVE PLATES of unique lead button construction. The buttons . . . rolled strips of corrugated soft lead . . . are pressed into holes of the lead-antimony grid. Forming action expands the buttons and locks them securely in place. Only a comparatively small portion of the total lead in the button is formed initially into active material . . . the balance is available for gradual conversion in service. This button construction is an exclusive Exide feature which results in unusually long life.

THE PERMANIZED® NEGATIVE PLATES—constructed of a lead-antimony grid . . . or framework . . . with a series of vertical ribs connected by short horizontal bars. Bars are flush with plate surface . . . extend only part way through the plate . . . are staggered on opposite sides. The active material . . . sponge lead . . . is formed of vertical strips or ribbons that extend from top to bottom of the plate between the vertical ribs and is locked in place by the horizontal bars. A type that has proved its merits in every kind of stationary service . . . developed to match the long life of the manchester positive plate.

SEPARATORS—Selected fine grain, knot-free wood separators, specially treated . . . teamed with low resistance slotted plastic separators . . . assure excellent high discharge characteristics under all operating conditions.

TERMINAL POST ASSEMBLY—The design effectively seals the opening through the covers—preventing electrolyte seepage . . . heavy strap and post castings with copper inserts in the larger sizes provide low resistance electrical path from plates to terminal.

COVER—deep seal covers of tough rubber designed to give trouble-free service.

MOLDED GLASS JAR—exclusive with Exide—the most modern in the battery industry . . . strong, uniform in dimension . . . clear glass for easy inspection and maintenance . . . straight-sided for compact assembly, neat appearance.

Where to use the new Exide-Manchex Battery

The new Exide-Manchex Battery with its high 1 minute rating is ideally suited for control bus and switchgear operation. Its use is equally suited for Emergency Lighting and Power and other storage battery tasks. The new Exide-Manchex Battery will provide up to 100% more capacity in the same given space.

Exide®
BATTERIES

1888 . . . Dependable Batteries for 61 Years . . . 1949

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

The National Telephone Supply Company

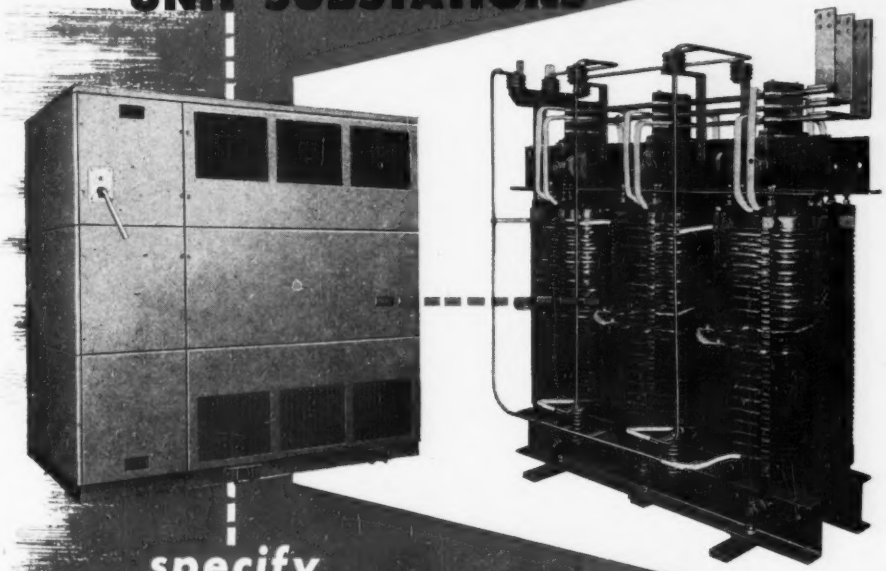
5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

. when buying

UNIT SUBSTATIONS



specify

Wagner TRANSFORMERS

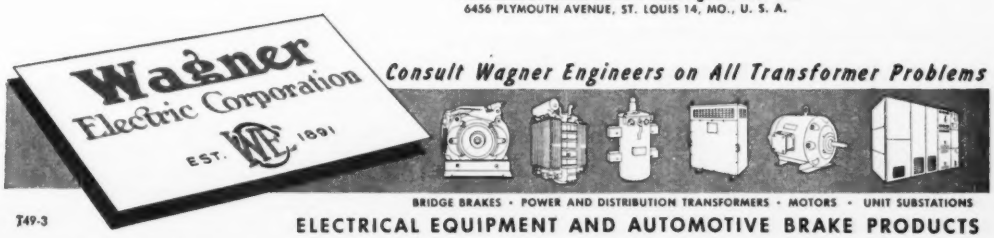
AVAILABLE IN RATINGS FROM 100 TO 2000 KVA

More than fifty years of transformer building experience has been incorporated in the design and construction of Wagner dry-type load-center transformers. Especially developed to meet industry's need for larger transformers for use in plant power distribution circuits, these units are compactly housed in neat, attractive enclosures, which can be arranged to include primary and secondary switchgear compartments to form readily accessible, closely-coupled unit substations. Complete enclosure of all equipment protects against accidental contact with live parts. Relatively light in weight, so they can be used in multi-story buildings, they are readily adaptable to any installation requirement.

Bulletin TU-56 describes in detail the transformers, the enclosures, the various types of incoming line sections available, and the optional equipment and accessories that can be furnished. Write for your copy today.

Wagner Unit Substation Transformers are also available in oil-filled and Noflamol types. Bulletin TU-181 gives information on the complete line of Wagner Power Transformers.

Wagner Electric Corporation
6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.



Consult Wagner Engineers on All Transformer Problems

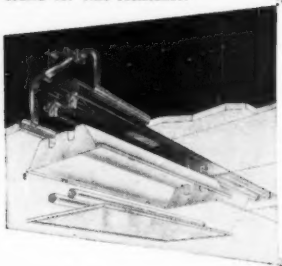
BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

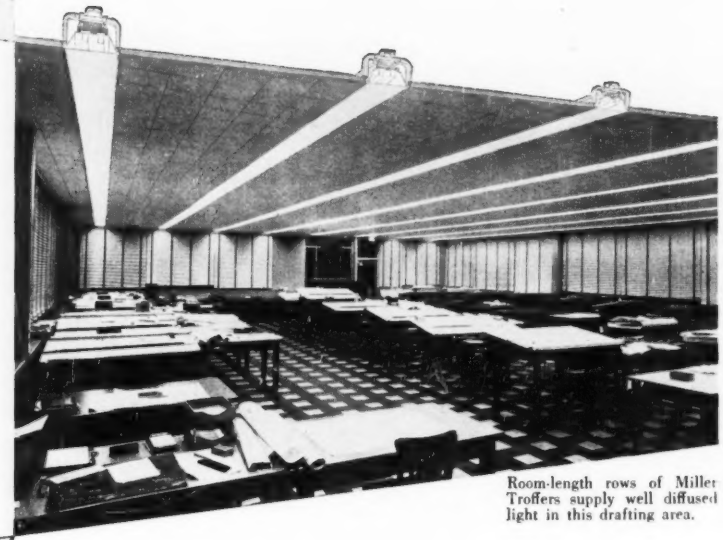
T49-3

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

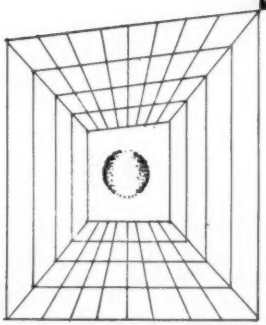
It Pays to Plan Lighting at the Drawing Board the MILLER Way

All parts are of quality construction. Channels are Bonderized for rust resistance.





Room-length rows of Miller Troffers supply well diffused light in this drafting area.



IT PAYS — because, besides providing the good lighting required, Miller Fluorescent Troffer Lighting Systems are a definite structural aid, most flexible for working out esthetic ceiling design and insuring architectural harmony . . . "CEILINGS UNLIMITED".* IT PAYS — because their wide range of reflector enclosures meet the lighting requirements of varied interiors. IT PAYS — because installation is simplified by Miller patented Ceiling Furring Hanger.

Miller lighting service is all-inclusive. It covers the needs of planned commercial and industrial lighting. Miller field engineers and distributors, conveniently located, are at your call.

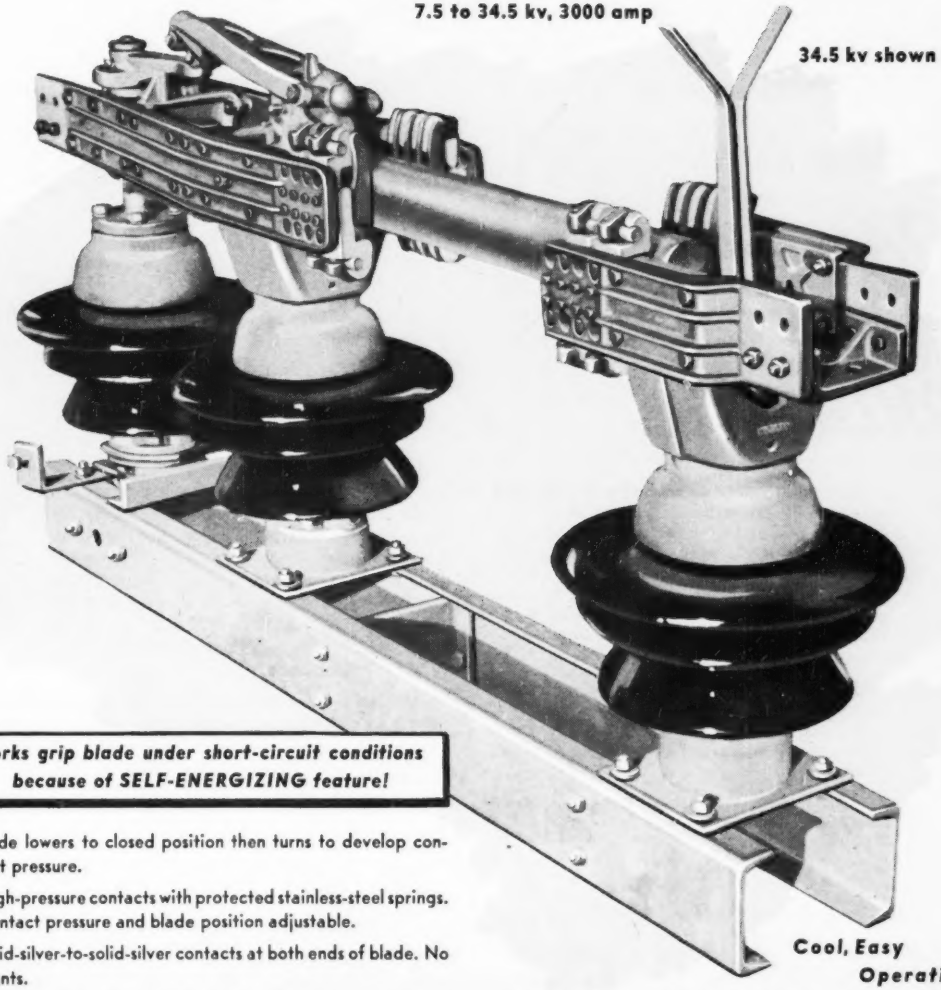
THE miller COMPANY
SINCE 1844
ILLUMINATING DIVISION, MERIDEN, CONNECTICUT
ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment. HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices. ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

*Reg. Trademark U. S. Pat. Off.

DISCONNECT
for Extra-Large Capacity

Type TW-30

7.5 to 34.5 kv, 3000 amp



34.5 kv shown

Forks grip blade under short-circuit conditions because of SELF-ENERGIZING feature!

- Blade lowers to closed position then turns to develop contact pressure.
- High-pressure contacts with protected stainless-steel springs. Contact pressure and blade position adjustable.
- Solid-silver-to-solid-silver contacts at both ends of blade. No shunts.
- Contact deflection is relatively large yet pressure varies only 5% over entire range of deflection. No critical adjustments. Pressure not affected by wear.
- Current-carrying parts all copper alloy or silver.

Cool, Easy Operation

- All bearings are anti-friction type including bearings in operating mechanism. No lost motion in switch or mechanism.
- N E M A standard.

Call

PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • P. O. BOX 419, GARY, INDIANA

LEONARD M. SLUSSER, 318 Dooly Block, Salt Lake City 1, Utah
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Other Representatives in Principal Cities

Heat can't Mix up this Mixer--

The electric food mixer, now a permanent part of the modern kitchen, comes in for constant, hard use in the preparation of 1,095 meals in the home during one year's time. Frequently, the mixer is run for long periods of time, placing a heavy load on the small electric motor which powers the mixer unit. Insulation at vital points within the control unit must be able to withstand high heat and heavy current loads.

BH Extra Flexible Double Braided Fiberglas Sleeving is used to insulate the resistor lead wire in the motor and control unit of the Model 3-B *KitchenAid* Mixer made by the Hobart Manufacturing Company.

Here is what the makers of the *KitchenAid* food mixer say:

"High temperature and high voltage is the particular strain imposed on sleeving used to insulate the resistor lead wire in the motor and control unit. The heat resistance feature of BH Extra Flexible Double Braided Fiberglas Sleeving led us to choose this sleeving. Dielectric tests were made and BH Extra Flexible Double Braided Fiberglas Sleeving withstood 2000 volts. The results obtained have been quite satisfactory."

BH Extra Flexible Fiberglas Sleeving stays flexible as string because no hardening varnish or lacquer is used. Will not split or crack when bent. Resists abrasion and wear. Heat resistant to 1200°F. Write us today about your insulation problem.

BENTLEY, HARRIS MFG. CO., CONSHOHOCKEN, PA.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

USE COUPON NOW

Bentley, Harris Mfg. Co., Dept. W-29, Conshohocken, Pa.

I am interested in BH Non-Fraying Fiberglas Sleeving for _____ (product)

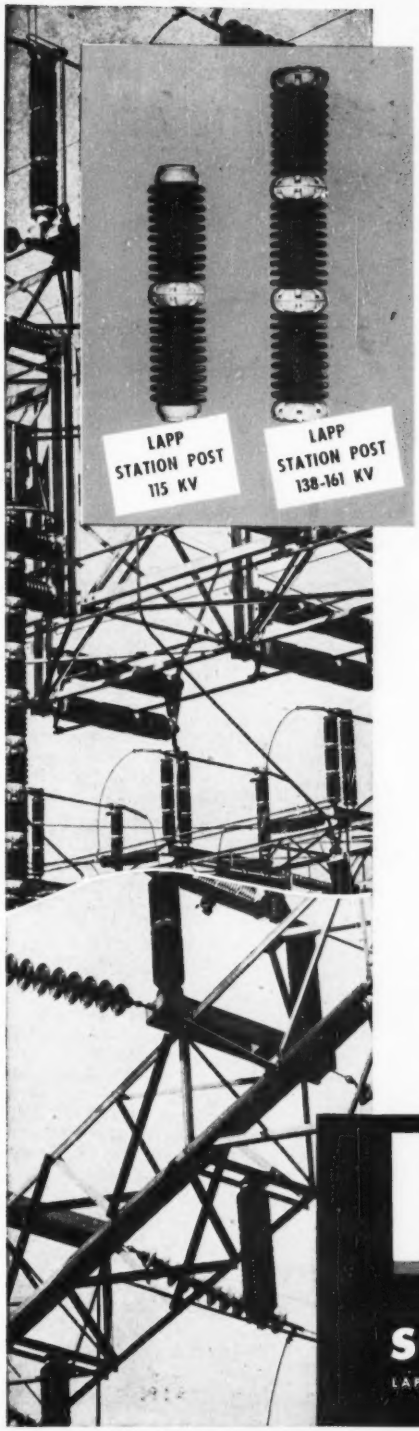
operating at temperatures of ____°F. at ____ volts. Send samples so I can see for myself how BH Non-Fraying Fiberglas Sleeving stays flexible as string, will not crack or split when bent.

NAME _____ COMPANY _____

ADDRESS _____

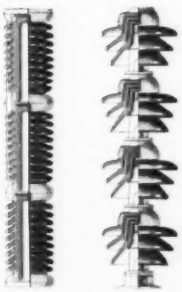
Send samples, pamphlet and prices on other BH Products as follows:

- ☐ Cotton-base Sleeving and Tubing
- ☐ Ben-Har Special Treated Fiberglas Tubing



LOOK BETTER...
PERFORM BETTER...
LAST BETTER...
LAPP STATION POSTS
AT 115-161 KV

In the 17 years since the introduction of the Lapp Post design, more and more companies have switched their construction standards to Lapp Line Post and Station Post insulators. It's not just that these modern insulators look up-to-date. They perform better and last longer—cause fewer outages—require less maintenance. Countless operating records prove the claims for Lapp Post insulators—better performance under arcover and under dirt conditions, elimination of puncture and cracking, greater rigidity in any mounting position.



COMPARE

Sketched at left are a Lapp Station Post and a conventional pin-type switch insulator—both for service at 138-161 Kv. Post construction calls for *six* cemented joints, metal caps *externally* attached—large-area low-intensity compression loading on porcelain. The pin-type has *twelve* nested porcelain parts, all small-area high-intensity loading depending on tension strength of porcelain—its weakest characteristic. You'll save trouble and improve operating records when you switch to Lapp Posts—for all voltages up to 161 Kv.

Lapp
STATION POSTS
LAPP INSULATOR CO., INC. • LE ROY, N.Y., U.S.A.

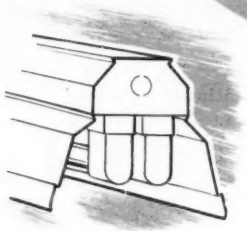
NOW!

Rounding out the line of

Wheeler

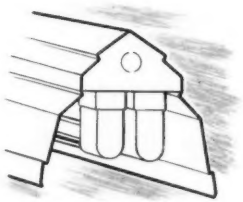
"SKILLED LIGHTING"

...New SLIMLINE Fluorescent Fixtures



INDUSTRIAL UNITS

End view of industrial type unit showing flat top. These units are designed for general industrial use under normal atmospheric conditions.



TEXTILE UNITS

End view of textile mill unit showing peaked top especially designed to eliminate frequent cleanings and to offer outstanding protection against humidity.

THIS SMART-LOOKING SLIMLINE fixture offers you more than just sleek beauty . . . it also offers a genuine "Skilled Lighting" unit for use with the new high efficiency SLIMLINE Lamps. Assures extra long service life with minimum maintenance.

Typical of Wheeler engineering thoroughness is the exclusive auxiliary lamp support at center of the fixture to prevent vibration of the 8 foot lamps. Fixture channel is in one piece . . . available in either baked enamel or Wheeler triple-guarded *vitreous porcelain enamel* finish. Reflectors are furnished in vitreous porcelain enamel finish only.

TWO TYPES: INDUSTRIAL-TEXTILE

The new Wheeler SLIMLINE is made for regular industrial application or for textile mill application. Textile mill units have peaked channels to prevent accumulation of fly, lint, dust and moisture.

HIGHEST EFFICIENCY

SLIMLINE lamps operate at the highest efficiency of any lamps. They start instantly . . . no special ballasts needed. If increased intensity is desired, 300 MA ballast is available to replace 200 MA ballast using same lamps.

EASIEST TO HANDLE

SLIMLINE fixtures have only 2 sockets . . . lamps have only 1 terminal pin in each end. Only two 8 foot lamps for a double-length fixture. Get all the facts on the extra value of these new SLIMLINE Units. Write to **Wheeler Reflector Company, 275 Congress St., Boston 10, Massachusetts.**

Distributed Exclusively Through Electrical Wholesalers

Wheeler REFLECTORS

SKILLED LIGHTING

MADE BY SPECIALISTS IN LIGHTING EQUIPMENT SINCE 1881

The EASIEST Way To Measure

INDUCTANCE • RESISTANCE • CAPACITANCE

● Completely self-contained, portable and always set up for immediate use, this impedance bridge is indispensable in any laboratory where electrical equipment is used. No hastily putting together a circuit, finding an oscillator, detector and power supply . . . they are all here permanently assembled in an accurate instrument . . . always ready for use at any time.

Over the major portion of its ranges this bridge is accurate for the majority of routine measurements in any laboratory. Its ranges are:

INDUCTANCE: 1 microhenry to 100 henrys
RESISTANCE: 1 milliohm to 1 megohm
CAPACITANCE: 1 micromicrofarad to 100 microfarads
STORAGE FACTOR (X/R): 0.02 to 1000
DISSIPATION FACTOR (R/X): 0.002 to 1

Included in the walnut cabinet are built-in standards, batteries, a 1000-cycle tone source for a-c measurements, a zero-center d-c galvanometer null detector and terminals for a headset for 1,000-cycle detection. Terminals are provided for an external generator for measurements from a few cycles to 10 k.c. Direct-reading dials add greatly to the ease and rapidity with which measurements can be made.

TYPE 650-A IMPEDANCE BRIDGE . . . $240

WRITE FOR COMPLETE INFORMATION

GENERAL RADIO COMPANY

Cambridge 39, Massachusetts

90 West St., New York 6 — 920 S. Michigan Ave., Chicago 5 — 950 N. Highland Ave., Los Angeles 38

Durasheath

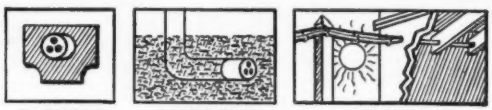
built for those TOUGH JOBS!

Small sizes or large . . . one, two or three conductors . . . moisture-resisting insulation . . . from 0 to 5,000 volts . . . Durasheath is built for rugged service:

Durasheath offers high tensile strength and resistance to impact and abrasion—*plus* extreme flexibility that makes it easier to handle. Also, Durasheath resists moisture, acids and alkalies generally found in the soil, eliminates problems of electrolysis, corrosion and extremes in temperature and is highly resistant to flame—making it possible to use a single type and size of cable in runs that are partly aerial, partly underground or in conduit.

For complete information, write for Publication C-27.

45450



IN CONDUIT ...UNDERGROUND ...IN THE AIR

Anacondaloy®-coated copper conductors are insulated with a moisture-resisting synthetic rubber compound, bound with color-coded rubber-filled tape and enclosed in a tough, high mechanical strength, moisture and flame-resistant outer jacket of Neoprene. Conductors have the lasting protection of a solid block of synthetic rubber and Neoprene.

®Reg. U. S. Pat. Off.

Durasheath

AN *Anaconda* PRODUCT

ANACONDA

ANACONDA WIRE AND CABLE COMPANY

25 Broadway, New York 4, N. Y.

PLANE SNIPS POWER LINE; CONTROLLER RE-ROUTES LOAD

L&N Load-Frequency Equipment Installed for Every-Day Service, Takes Emergency in Stride

This plane crash provided an unexpected test for L&N equipment . . .

. . . in the Load Dispatcher's Office, Glenwood, N. Y., which handled the emergency efficiently . . .

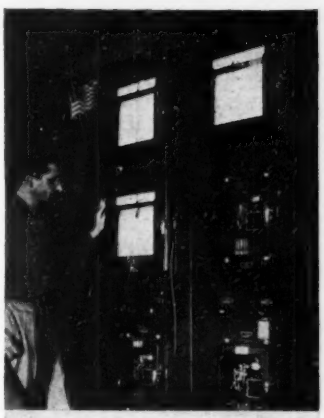
When Long Island Lighting Co. installed L&N Load-Frequency Control equipment, they were seeking principally to simplify the every-minute job of supplying power from the most efficient source.

The Control met their needs completely. It quietly directed traffic both within the Long Island system and along a tie to Consolidated Edison. It saved time, trouble, and money.

But before long a different kind of test confronted the equipment. An airplane, crashing into high voltage lines, chopped off 60,000 kw of the Glenwood Station's 145,000 kw load.

Instantly the excess output flowed along the tie. But in another instant, the Load-Frequency Controller jumped into action. It reduced the generation in quick steps. Correspondingly it cut back on the tie load. In a matter of minutes, the Station was generating only its own requirements. And power service on the station side of the break had not even trembled.

Why not investigate the possibilities of L&N Automatic Control for routine or emergency operation in your power plant?



. . . with control centralized as shown: left panel, top to bottom, Micromax Frequency Controller, Tie Line Load Controller, Master Load-Frequency Controller. Right panel, Micromax Reactive Load Recorder for Tie Line interchange, two Proportional Load Controllers.

LEEDS & NORTHRUP COMPANY, 4938 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl. Ad N-56-461(1)

E-M JOB-ENGINEERED

Protection!

FOR HEAVY-DUTY INDUCTION MOTORS

One of industry's most pressing needs has long been induction motors that can be depended on to operate with year-in-and-year-out reliability on the toughest, heavy-duty jobs. It is a need that has resulted in the brilliant engineering and sturdy construction of E-M Squirrel-Cage Induction Motors, with their indestructible rotors, long-life insulation and cool-running, wear-resistant bearings.

Along with the other extra-value advantages of these heavy-duty motors comes E-M job-engineered protection.

This protection gives added assurance of reliable performance. Without it, there is constant danger under most conditions of water or other destructive agents falling into the vital parts of the motor and eventually causing damage and costly repairs.

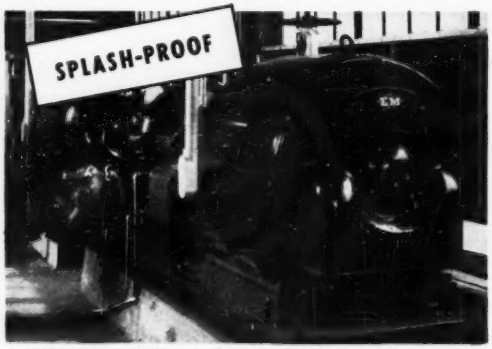
E-M Induction Motors are available with the following types of job-engineered external protection:

DRIP-PROOF—A strong, steel shield provides protection over a 30° arc, safeguarding the motor against falling liquids or particles. Drip-proof construction is recommended in conditions when the more complete protection of splash-proof or enclosed construction is unwarranted.

SPLASH-PROOF—A full 200° arc of protection safeguards motors with splash-proof construction. It is a type of construction found advisable in many paper mill, chemical plant and pumping plant installations and is recommended whenever there is danger of splashing or flying particles, as in hosing down floors.

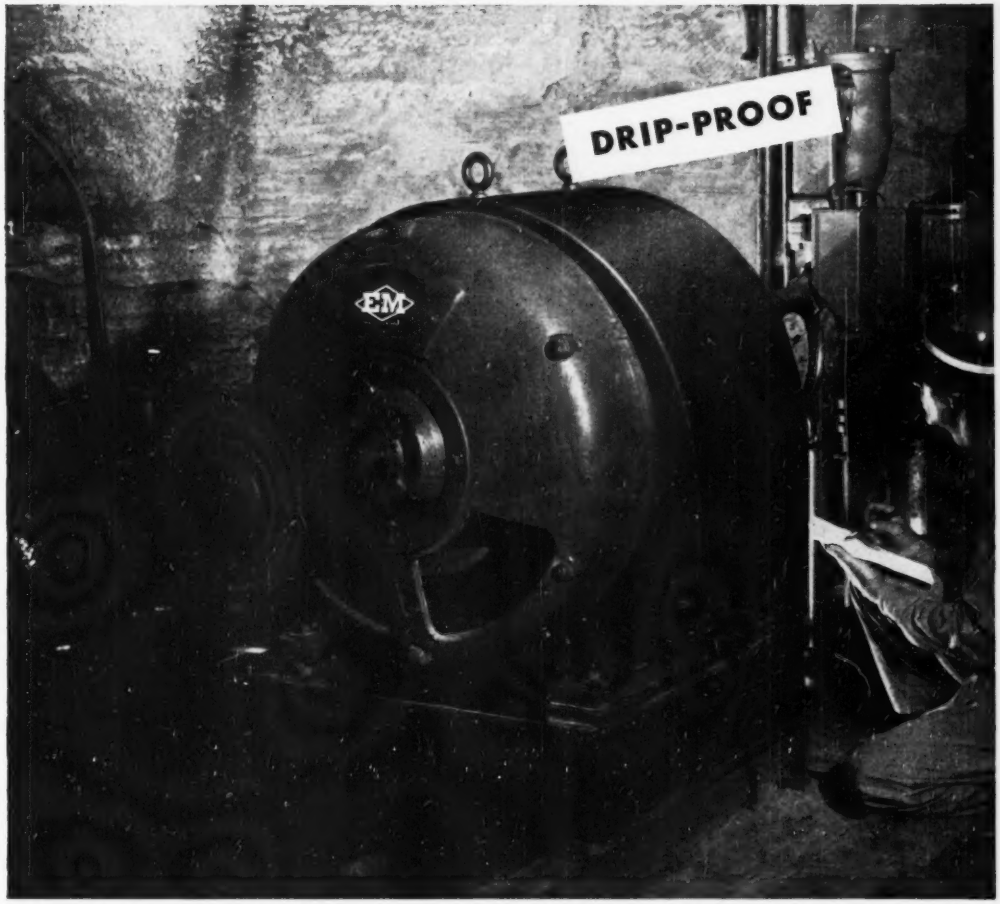
Enclosed, Self-Ventilating or Separately Ventilated—These are special types of motor protection recommended when there is excessive air contamination or high air temperatures, and it is desirable to either filter the air or to draw it from cooler, uncontaminated sources.

40 YEARS OF BIG MOTOR KNOW-HOW HELPS BUILD OUTSTANDING INDUCTION MOTORS



Three 400 hp, 1800 rpm splash-proof E-M Motors drive booster pumps in Southland Paper Mills plant at Lufkin, Texas. Regular hosing-down operation can't touch E-M Motors protected in full 200° arc against damage.

One of 3—1000 hp, 1800 rpm, 4160 volt Squirrel-Cage Induction Motors for Texas Pipeline Co. to operate in locations where surrounding air is contaminated with Hydrogen Sulphide gas, weak acid and abrasive dust.



Heavy-duty Induction Motor of drip-proof construction is protected against falling particles and dripping liquids in the St. Joseph Lead Company mine at Leadwood, Missouri.

A little improvement in designing gives a lot in extra value

In the E-M drip-proof motor shown above—Note that the frame flares out at the bottom to accommodate the extra volume of discharge air in that region. This is another instance where E-M's experience in big motor engineering results in more efficient design.

Important things have been happening in induction motor design and construction at Electric Machinery . . . things that mean a big difference in induction motor reliability, economy, maintenance. Write now for the full story . . . just ask for your publications 189 and 190.

Types of E-M Squirrel-Cage Induction Motors

Two-pole; drip-proof; ring lubricated bearings

Two-pole; drip-proof; pressure lubricated bearings

Four or more poles; drip-proof; sleeve bearings

Four or more poles; splash-proof; ball bearings

ELECTRIC MACHINERY MFG. COMPANY, MINNEAPOLIS, MINNESOTA

E-M

SPECIALISTS IN **BIG MOTOR ENGINEERING**

1300-TPA-2059

Which meets your system requirements?

coordinated substations?

For overhead subtransmission circuits

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MODERN EQUIPMENT FOR BETTER DISTRIBUTION SYSTEMS

. . . . unit substations?

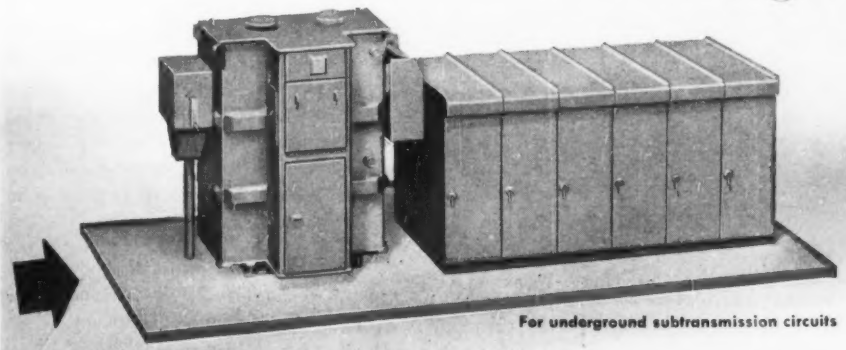
Today, *modern* substations for any system requirement may be purchased in two basic forms . . . as *Unit Substations* or *Coordinated Substations* . . . both supplied by Westinghouse.

Westinghouse helped introduce the *Unit Substation.* This type of substation is designed, built, tested and shipped complete . . . ready for connection to your system. Briefly, a *Unit Substation* consists of a transformer, and the necessary switchgear, combined to form an articulated unit to which the subtransmission and primary feeder circuits can be directly connected.

The *Coordinated Substation* consists of one or more *Unit Substations* with complete overhead terminating structure and any necessary terminating facilities. This equipment is shipped in easily-installed, factory-assembled and prefabricated sections.

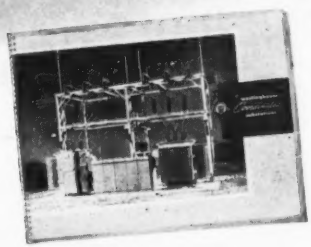
Westinghouse can supply a complete substation in *any* form . . . from incoming line to outgoing feeder . . . for *any* system. Whatever your power distribution requirements may be . . .

YOU CAN BE **SURE**
IF IT'S Westinghouse



For underground subtransmission circuits

Here's the Complete Story **ON WESTINGHOUSE COORDINATED SUBSTATIONS!**



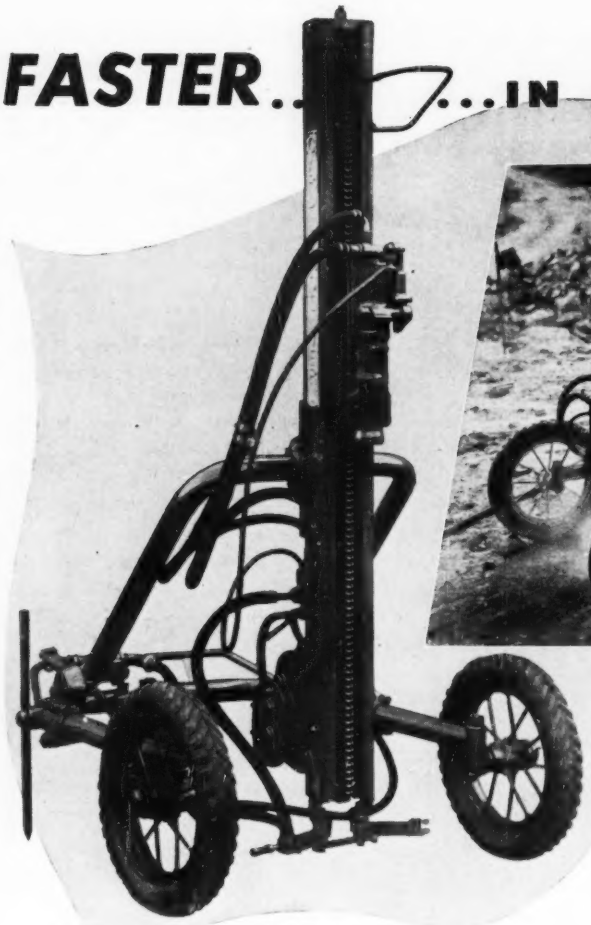
This 86-page book presents the standardized Westinghouse line of Coordinated Substations. Fact-filled pages of photographs and line diagrams give you complete information on all types . . . covering all basic requirements from the simplest to the more involved types of distribution substations.

To get your copy, call your nearest Westinghouse office. Ask for booklet B-4061 or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-97132

FASTER...

...IN ANY GROUND!



Hard and solid ground, soft ground, broken ground—they are all alike to Gardner-Denver's *new*, faster drilling URM99 Wagon Drill. Designed for 6-foot steel changes, the motor feed is operated by a powerful 5-cylinder radial air motor. The URM carries a 4" bore derrick drill—ideal for faster drilling on highways, construction projects or in quarries.

For complete information, write
Gardner-Denver Company
Quincy, Illinois

OTHER FEATURES OF THE NEW URM99 ARE:

EASIER CONTROL— hammer action and hole cleaning air controlled by a single throttle handle. A regulating valve easily maintains correct feed pressure. Feed can be reversed instantaneously for effective churning.

BETTER HOLE CLEANING— Air actuated exhaust control valve conveniently operated by drill throttle handle.

EASIER SPOTTING—centralizer or hole spotter held in place positively in both open and closed positions.

WIDE FLEXIBILITY—U-bar adjustable from slightly above horizontal to practically vertical. Wheels adjustable to 90 degrees for line drilling.

QUICKER STEEL CHANGES— adjustable mounting cone on mast allows rapid adjustment of drill steels to suit ground conditions. Drill steel support at top of mast assists in faster steel changes.

Where air supply is limited, the URM89 with a 3¼" bore derrick drill can be supplied. A compressor of 210 c.f.m. is adequate for the URM89.

GARDNER-DENVER
SINCE 1859

YOU CAN GO

Up and Up!

. . . with Square Copper Tube Bus Conductors made by Chase

YES, the square construction of Chase Copper Tube Bus Conductors, provides high mechanical strength in all directions . . . and enables you to install a conductor taller than ever before.

Since Chase Square Copper Tubes have four flat sides, they allow adequate and uniform pressure to be exerted between the large contact surfaces, resulting in *firm, secure joints.* In addition to these advantages—great mechanical strength, ability to make efficient joints and connections—this Chase product is high in electrical and thermal conductivity . . . has high current-carrying capacity . . . is greatly resistant to corrosion.

Write today for informative booklet! Address Chase Brass & Copper Co., Dept. EW19

Chase

the Nation's Headquarters for
BRASS & COPPER

WATERBURY 91, CONNECTICUT

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES† MILWAUKEE MINNEAPOLIS† NEWARK
NEW ORLEANS NEW YORK PHILADELPHIA† PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO† SEATTLE† ST. LOUIS WATERBURY (†Indicates Sales Office Only)

NOW! Armoring...

1 ARMORING MADE EASY

with Locke Preformed Armor Rods on corner post installation. Here linemen have taken strands in bunch and placed across conductor. Note how rods have been pre-twisted by machines at factory to fit conductor. Time-consuming process of rod-twisting formerly done by linemen is eliminated.

2 NOW LINEMEN TWIST

strands around conductor from center toward ends. They twist in opposite directions, keeping ends free. As twisting progresses outward, strands easily and quickly "snap" into position. No wrench or other installation tools required.

3 ONE FINAL TWIST

and corner post armoring installation has been completed . . . in matter of seconds! No clips, clamps, special tools or skill has been required. Yet rods grip conductor like vise every inch of their length. Have your linemen try them . . . with free full-size samples we'll gladly supply. Mail coupon at right today.

before you buy.. stop! see what LOCKE'S got...

in 3 Simple Steps!

– You Save Time, Trouble, Money

with LOCKE PREFORMED armor rods!

SAVE TIME—Because they're pre-twisted at factory, Locke PREFORMED Armor Rods "snap" onto your conductors by hand . . . don't have to be twisted on with tools—don't need clips or clamps to *keep* them on. Linemen simply lay strands across conductor—twist—and the job is done . . . in seconds!

SAVE TROUBLE—"No clips, no clamps, no special tools!" Locke PREFORMED Armor Rods make nighttime and cold weather installations easy—there are no small parts to worry about—no complicated operations to go through. The hoist goes up the pole just once—carrying *only* the PREFORMED Armor Rods!

SAVE MONEY—Besides giving you *more* trouble-free installations per man-hour, Locke PREFORMED Armor Rods cut your costs by cutting your losses. *Re-usable* because they're permanently formed of tough, springy metals* . . . they also give *better conductor protection* because they grip tighter, cover completely. This means no chafing, no abrasion, no slippage . . . less corrosion at support points!

**Locke Preformed Armor Rods are available for every size and kind of conductor . . . come in aluminum alloy, galvanized steel, copper and bronze.*

"Always see your locke distributor first"

55 Years' Experience in Hardware and Insulators

LOCKE
INCORPORATED
BALTIMORE, MARYLAND

TEAR OFF . . . . FILL IN . . . . MAIL . . . . for FREE Working Samples

LOCKE, INCORPORATED • • BALTIMORE, MARYLAND

NAME.....

TITLE.....

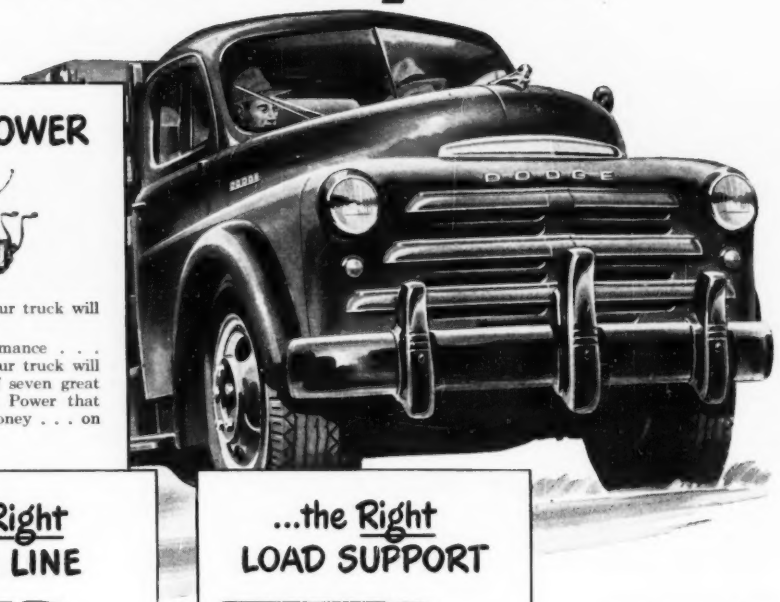
COMPANY.....

ADDRESS.....

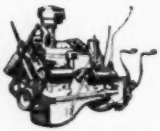
Please Indicate Conductor Size and Kind

before you buy.. stop! see what LOCKE'S got...

Here's what "Job-Rated" means to you...



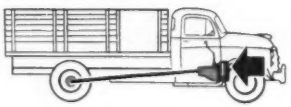
the Right POWER



"Job-Rated" means your truck will have the right power.

For maximum performance . . . with economy . . . your truck will have the right one of seven great Dodge truck engines. Power that fits your job saves money . . . on gas, oil, and upkeep.

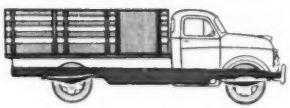
...the Right DRIVE LINE



"Job-Rated" means your truck will have the right driving units: Clutch, transmission, rear axle, gear ratio . . . and other load-*moving* units.

You get more efficient performance. Your truck stays *on the job* . . . lasts longer.

...the Right LOAD SUPPORT



"Job-Rated" means the right support for your load. Frames, axles, springs, bodies, wheels and tires—all are the right size for the weight of your truck . . . and the load it hauls. Result: Your truck "stands up" . . . maintenance costs are low.

... in short, the Right truck to fit your job!

To get a *"Job-Rated"* truck, see your Dodge dealer.

Tell him three things: (1) The weight of the loads you haul; (2) the type and size of body you need; and (3) your grade and speed requirements.

From 248 basic chassis models, your Dodge dealer will specify a *"Job-Rated"* truck that fits your job. Every unit . . . from engine to rear axle . . . will be *"Job-Rated"* . . . engineered and built for your loads.

Such a truck will save you money . . . when you buy it, and every mile you use it. In addition to economy of operation, it will give you dependability, and long, trouble-free life. And remember . . . only Dodge builds *"Job-Rated"* trucks!

DODGE "Job-Rated" TRUCKS

FIT THE JOB . . . LAST LONGER

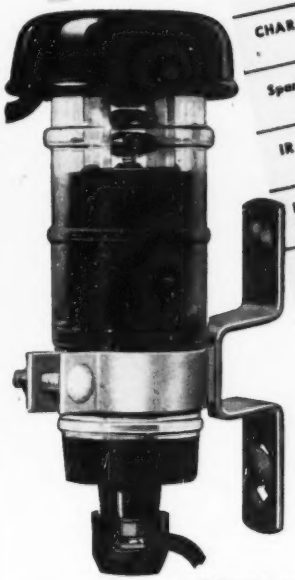
For the Location of the Dodge Dealer in Your Community, Consult Yellow Pages of Your Phone Directory

compare these characteristics

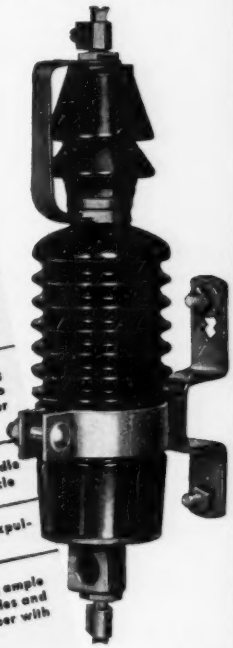
when you decide on Valve or Expulsion Type Arresters

CHECK the characteristics your system requires

CHARACTERISTIC	VALVE L-M Heavy Duty Type E	EXPULSION L-M Heavy Duty Type PF
Sparkover	Low—especially on steep front waves	Moderate—low enough for fast response
IR Drop	Low enough for ample transformer protection	Very low—practically none
Discharge Capacity	Very high—ample for all requirements	Very high. Ample for all requirements
Stability—long life	Extremely stable, with characteristics unchanged during long service	Exceptionally good, with very long life, though probably does not quite equal valve type
Follow-current control	Negligible follow current, causes no disturbance on the line; cut off at first current zero by valve action.	Very low for this type of arrester; promptly interrupted at first zero by exclusive wedge-chamber arc switching action
Back-up Fuse Links	No limitation on size as follow current drawn is extremely low	Must be large enough to handle follow current for a half cycle
Noise	Absolutely silent	About the same as an expulsion fuse.
Construction, features	Exceptional moisture sealing; double seals top and bottom. Glass housing for visual inspection of condition	Heavy duty construction; ample gas vent; heavy electrodes and horn fibre arcing chamber with wedge design



L-M Heavy Duty Type E Valve Type Distribution Arrester



L-M Heavy Duty Type PF Expulsion Arrester

• Some engineers prefer valve type arresters, some prefer the expulsion type, depending on their experience, requirements of the system, and location at which the arrester is to be used. Although expulsion arresters are often used in urban areas, they are more generally recommended for rural use, not only because they are noisy in expelling the arc following a surge, but mainly because the lower the system short-circuit current, the longer will be the life of the arrester.

Both types of L-M Arresters are heavy duty design, which assures many years of service and makes it possible to offer these arresters with no limit on system capacity.

Excellent bulletins are available on both types. Both are well illustrated, factual, informative. Write for either or both—**address Line Material Company, Protective Equipment Division, Milwaukee 1, Wisconsin.**

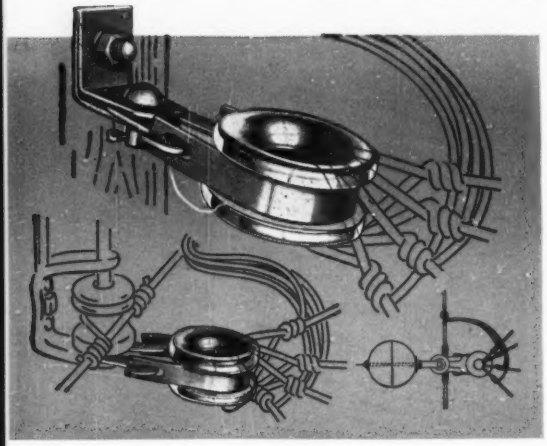
Bulletin on Heavy Duty Valve Type E L-M Arresters

Bulletin and Handbook on Expulsion Type PF Arresters

LINE MATERIAL Lightning Arresters

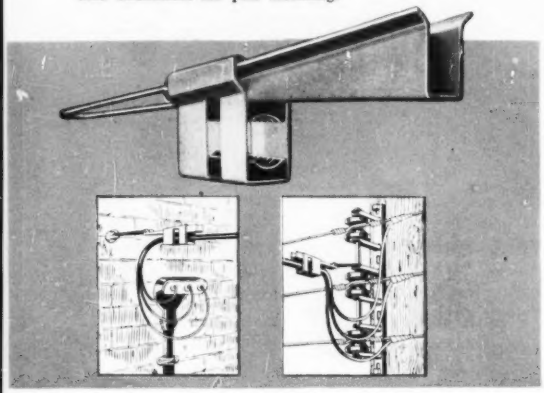
Complete Equipment for all distribution requirements

Some L-M Specialties to help you soften up tough jobs

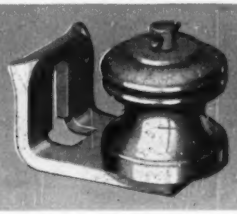


Construction superintendents are always running into tough jobs—and usually manage to handle them successfully. But often these jobs can be handled more easily and quickly with an L-M Pole Line Specialty. There's a wide variety of special clamps, grips, clips, and fittings—this page shows just a few. It will probably be worthwhile to get information on others—perhaps you'll find the "answer to a lineman's prayer." Give it a try, anyway—won't you? Ask the L-M Field Engineer, check your L-M catalog, or tell us your troubles, and let's see if we can't help you lick some of them. **Write Line Material Company, Hardware Division, Milwaukee 1, Wis.**

L-M Take-Off Insulator for Service Drops, No. A-260010—Simplifies installing, replacing, and removing multiple service drops and replacing main secondary conductors, in both old and new construction; may be substituted for secondary racks on pole face opposite main secondary rack conductors. Brown glazed wet process insulator, 4" outside, 1½" hole, set in heavily galvanized steel band; steel yoke; with or without steel pole face attachment for pole mounting.



L-M Angle Bracket No. A-330002



Heavily galvanized ⅝" x 3" steel angle bracket, with spur on mounting side to prevent twisting on the pole; ⅝" insulator pin welded on. Mounting slot is wider in base so bracket can be slipped over bolt head before tightening bolt.

Dead End Fittings

L-M Grip-Tite Service Bracket, Nos. 1870-1874—The greater the pull, the tighter it grips the cable. The wedge-shaped channel does the trick. As the pull increases, the stirrup slides toward the wider part of the channel, clamping the Bakelite jaws tighter together. Bail and hook permit movement with minimum bending of cable. Or bail may be placed directly around through bolt of a rack. Self aligning Bakelite jaws, galvanized stirrup and channel; bronze bail. Two sizes, with channel 6⅜" and 8⅜", bail 5" long.

Heavy forged steel eye, No. 1739, 2⅜" x 2⅞", for attaching clevis and strain insulator to machine bolt, or for attaching a back guy to double arming bolt. Tapped for ⅝" bolt unless ordered otherwise. Breaking strength 24,000 pounds. Hot dip galvanized.

Forged steel or malleable iron clevis, Nos. 1741 etc. and 10741 etc.; for attaching strain insulators and back guys to a double arming bolt. Thoroughly galvanized. Several sizes from 1¾" to 3⅜" inside length, tapped for ⅝" or ¾" bolts.

LM

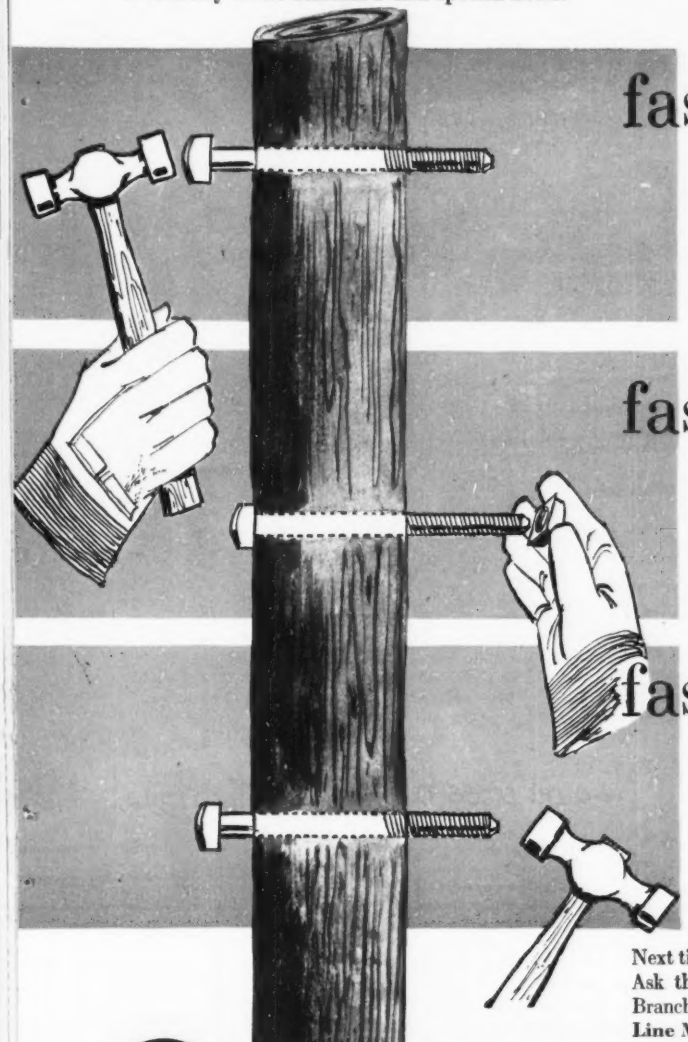
LINE MATERIAL Pole Line Hardware

Complete Coordinated Equipment for all Distribution Requirements

You can speed up construction with

L-M Buffer Point Bolts

Buffer Points are standard on all L-M Bolts 6" and longer, including carriage bolts, machine bolts and double arming machine bolts, eye, double arming, and thimble eye bolts and many other standard and special bolts.



faster driving

tapered buffer point guides the bolt through the hole, with less friction

faster threading

buffer point guides the nut right onto the thread—no fumbling, no lost time

faster salvaging

hammering the point removes the bolt quickly—can't hurt the thread

Next time you order bolts, get L-M Buffer Point Bolts. Ask the L-M Field Engineer, call the nearest L-M Branch, or write, wire, or phone **Hardware Division, Line Material Company, Milwaukee 1, Wisconsin.**

LINE MATERIAL Pole Line Hardware

Complete Coordinated Equipment for All Distribution Requirements

NEW KYLE

TYPE "L" OIL CIRCUIT RECLOSER

Now you can have Kyle recloser protection for lines with loads up to 100 amperes and fault currents as high as 4000 amperes.

These heavy fault currents can be handled successfully because of a new cross blast method of arc extinction, explained and illustrated below.

SOME FEATURES OF THE NEW KYLE TYPE L

Phase to phase operating voltage 2.4 to 15 kv.

Ratings: 25, 35, 50, 70, and 100 amps, for minimum tripping currents of 50, 70, 100, 150, and 200 amps, respectively

Permits precise coordination with line or back-up fuses, sectionalizers, other reclosers, and breakers.

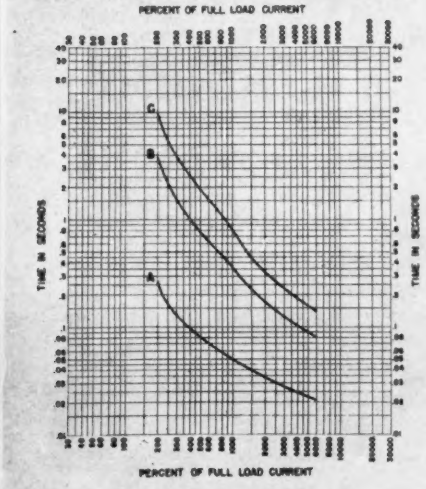
Insulation level meets requirements for 15 kv station equipment.

Impulse level 110 kv.

Control mechanism fully hydraulic; virtually free from variations caused by oil temperature-viscosity changes; rugged, shock-proof, trouble-free.

Size: approximate overall height 37 inches; tank diameter 11 inches; weight, complete with oil, 170 pounds.

Time Current Curves!



Choice of Operating Sequences . . . Refinements in the new type L hydraulic control mechanism provide greater accuracy of timing and a wider selection of characteristics.

Standard sequence is two fast operations, two retarded. This standard sequence is represented in the chart at left by two curves A and two curves B. *Optional sequences*, easily changed in the field by adjusting the time selector plate or adjusting one small part are: four fast operations (four curves A); *or* two fast and two extra-retarded (two curves A, two curves C). Various other sequences are available from the factory.

New oil cross blast arc extinction!

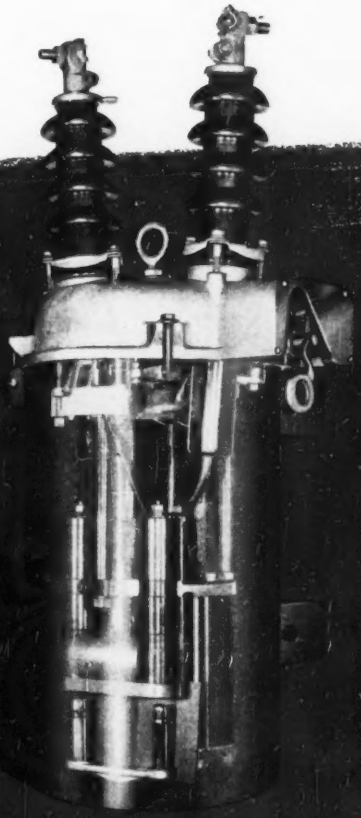
This unique design provides rapid arc extinction, with minimum arcing time, and freedom from restrikes at *all current values and power factors* within the recloser rating. Arcs are drawn in series. The heavy contacts are independently housed, one in a pressure chamber, the other in the venting chamber. Gas formed in the pressure chamber cross-blasts oil into the venting chamber, extinguishing the arc.

- Pressure Chamber
- Cross Blast Chamber
- Venting Chamber
- Copper Tungsten Contact Tips
- Quick make, quick break contact action

Kyle Company Division of Line Material Company

LM KK LINE MATERIAL

WITH UP TO 4,000 amps Interrupting Capacity



The new type L has all these outstanding Kyle Recloser features

Three reclosures before locking out, with a choice of operating characteristics

Coils interchangeable in the field

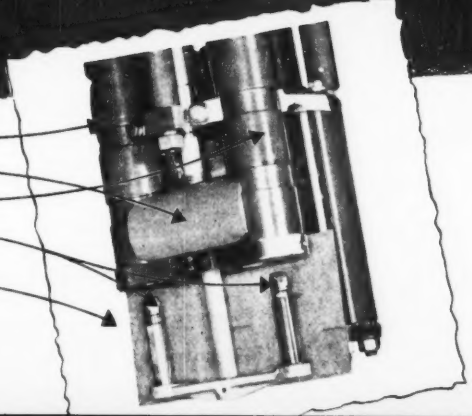
Trip-free operating handle . . . many other safety features

Large cast aluminum cover, sealed construction, with four hold-down lugs. Cover and mechanism may be rotated in steps of 90 degrees for most convenient operating position

Generous-size sleet hood integral with cover, protects operating handle and counter

Sturdy lifting eye

Mounting brackets meet EEI-NEMA standards for small transformers



Read all about it!

This fast-moving bulletin gives details, explains operation, in pictures and few words. Ask the L-M Field Engineer for a copy, or let us send you one. Address **Line Material Company, Kyle Company Division, Box 2077, Milwaukee 1, Wis.**

RECLOSERS *. . . also Complete Coordinated Equipment for All Distribution Requirements*

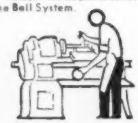
They have what it takes

TELEPHONE LINEMEN have the traditional Bell System spirit of service that aims to "get the message through." They also have what it takes *in the way of equipment and supplies.*

Their wires, cables, poles, tools and countless other things are provided by Western Electric—maker or supplier of practically everything used in your telephone service. We carry stocks of 31,000 different items to help all Bell telephone people, not only to do their daily job of maintaining and expanding telephone facilities but also to meet sudden emergencies.

• Western Electric has been a part of the Bell System for many, many years—ever since 1882. Our people share in the System's spirit of service. We, too, are always ready to answer the unexpected hurry call—to help "get the message through" for you.

MANUFACTURER of telephone apparatus for the Bell System.



PURCHASER of supplies for Bell Telephone companies.

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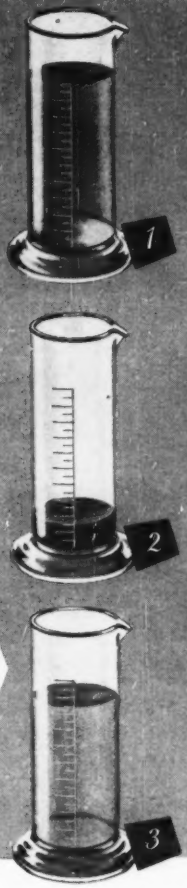
Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

Extra Refining
means *Superior Performance*

GULFCREST
is the only turbine oil refined by the
Alchlor Process



Gulfcrest is the only turbine oil that's Alchlor-processed. This is an extra refining step. It makes Gulfcrest extra pure and extra efficient.

In Cylinder 1 you see the oil that will become Gulfcrest. It has already gone through the usual steps used in refining most other turbine oils—but has not yet been Alchlor-processed.

In Cylinder 2 you see the part—approximately 15%—discarded by the Alchlor Process. This is the part that, when allowed to remain in turbine oil, is most likely to oxidize, increase neutralization number, and form sludge, emulsifiers, and harmful acids.

In Cylinder 3 you see the finished Gulfcrest — the incomparably pure lubricating oil that gives outstanding performance and helps you keep steam turbine systems clean indefinitely. To make it even finer, special inhibitors are added to it—they give it still greater stability and protection against corrosion.

Call in a Gulf Lubrication Engineer today and ask him to recommend the proper grade of Gulfcrest Oil to meet the specific requirements of your turbines. Write, wire, or phone your nearest Gulf office.

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Please send me, without obligation, a copy of your booklet "Gulfcrest Oil for Steam Turbine Lubrication."

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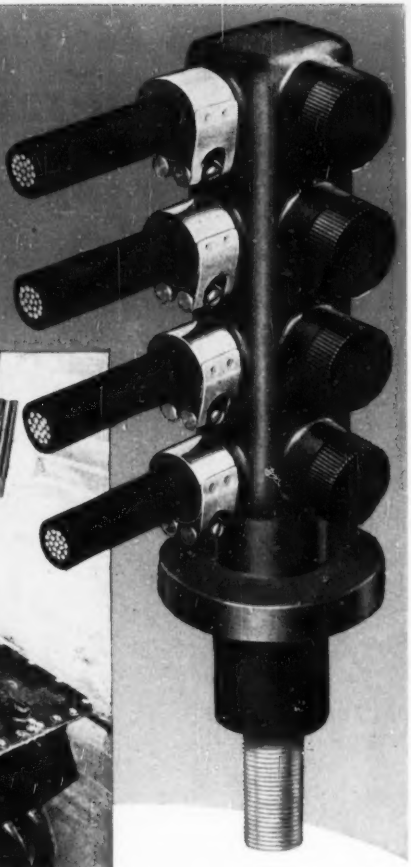
BURNDY STUD MOLE

(Type KMLD)



Simplifies multiple connections to transformers . . . underground

TYPE KMLD Stud Mole, insulated with oil resistant Neoprene, provides the simplest, quickest means for making secondary connections at the transformer itself, eliminating many joints and junction boxes. Cables are quickly connected to the Stud Mole merely by inserting ends into outlets, and tightening socket head pressure screws. Phenolic insulating plugs cover the screws. The joint is completely sealed by tightening the non-corrosive clamps around the outlet insulation. NO TAPING NEEDED. Clamping plates seal KMLD to transformer housing without need for porcelain bushings. Each outlet accommodates the rubber insulation on all conductors up to 4/0, through use of bushings for smaller cable sizes. Type KMLD may be installed by the transformer manufacturer or by purchaser after consulting the manufacturer.

Bulletin 48Z1 gives full details on KMLD, as well as on Type KME Mole for low capacity use in light load areas. Ask your Burndy representative, or write direct for your copy.

Connect with

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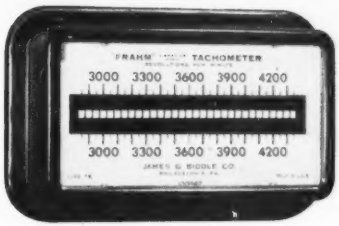
Tuned... like a Pipe Organ

The resonant-reeds in Frahm instruments are even more simple, accurate, trouble-free and long-lived than the pipes in an organ. There is literally nothing to wear or get out of adjustment. They are permanently tuned for the life of the instrument and each reed responds to its own vibrational frequency, swinging unfailingly into resonant action.

There are three important applications of the Frahm Resonant-Reed principle:

1. *Tachometers,* that are mounted directly on turbines and other equipment—and require no belts, gears or electrical connections . . . also portable types for hand use. For speeds between 900 and 100,000 rpm or vpm. *Bulletin 31-W.*
2. *Frequency Meters,* wherein the reeds are actuated directly by a small electro-magnet, and give instant indications of frequency between 15 and 500 cps. *Bulletin 32-W.*
3. *Frequency-Sensitive Relays,* which operate on a given frequency impulse or upon slight deviation from a specified frequency. Particularly appropriate where a frequency impulse can be super-imposed, for example, on a d-c circuit—also used as a frequency monitor.

Correspondence on these and other applications of Frahm Resonant Reeds will be welcomed.



Shown above is the Frahm Tachometer for permanent mounting. To the left is the miniature type Frahm Frequency Meter for permanent mounting.

JAMES G. BIDDLE CO.

Electrical & Scientific Instruments

1316 ARCH STREET, PHILADELPHIA 7, PA.

You may have *plenty* of extinguishers . . . BUT are you *sure* they're ready for action?

Periodic inspection and maintenance, recharging when necessary . . . these steps are essential to keep your fire extinguishers ready for *immediate* action.

Perhaps this involves a serious drain on the time of your personnel—who may be urgently needed for productive tasks. If so, here's a suggestion.

Why not let your Kidde representative take on the job?

He is prepared to offer you, on an annual contract basis, a comprehensive service covering all phases of fire-extinguisher service. He will call at regular intervals, to check the condition of your equipment, and will let you know immediately when recharging and repairs are needed. He has full facilities for the actual handling of the recharging or repairs.

Such an arrangement can help you, in other ways, to make most effective use of your fire extinguishers. As a specialist in fire-fighting, your Kidde representative may be able to *locate* your extinguishers to better advantage. Perhaps one extinguisher is hard to reach. Perhaps two types of extinguishers would give better protection if their positions were interchanged. You'll find such a service well worthwhile—why not look into it?

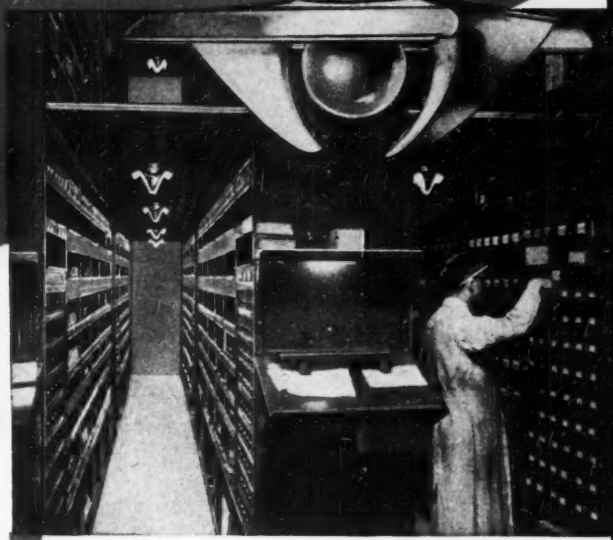
The words "Kidde" and "Lux" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

Kidde

Walter Kidde & Company, Inc. • **1230 Main St., Belleville 9, N. J.**

BETTER LIGHT

for the Eyes of Industry

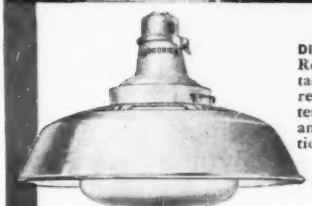


Appleton Lighting Equipment

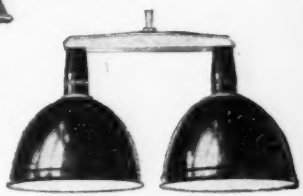
Depend on Appleton Lighting Equipment for the illuminating efficiency that spells better industrial workmanship, smoother production. Make every industrial job you plan a model of better lighting by specifying Appleton fixtures, expertly engineered for superior illumination, lower maintenance.

The Appleton "Goodrich" Stocklite shown above is typical. Diffusing light from eight different reflecting surfaces, the Stocklite provides the proper distribution of light in narrow stock aisles, without spotty distribution or unpleasant glare.

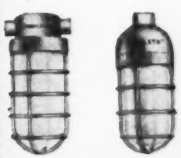
Hundreds of lighting specialties of equally expert design comprise the *complete* Appleton Line of ruggedly built fixtures, meeting virtually every industrial requirement — indoors or out. Now including the famous line of lighting specialties formerly manufactured by the Goodrich Electric Company, Appleton Lighting Equipment points the way to better lighting at minimum service, installation and operating cost.



DISKONECT GLASSTEEL DIFFUSER—Reflector, lamp and globe may be detached from hood as unit, without rewiring. Provides soft, yet high intensity illumination on both horizontal and vertical surfaces without objectionable shadows.



TWIN-HIGHLITE HIGH-MOUNTING FIXTURES—Designed to produce high levels of illumination from a minimum number of outlets in high bay industrial interiors. Easily serviced. Equipped with easy-to-wire channel for mounting on single suspension. Porcelain-enameled.



APPLETON VAPOR-TIGHT FIXTURES—Newly designed. Made of tough malleable iron. Also available in the *complete* Appleton Line are Explosion-Proof and Dust-Tight Lighting Fixtures, blanketing all requirements for hazardous locations.

USE THE BIG APPLETON CATALOG—for convenient purchasing of all electrical equipment. This big buying guide is a fully detailed and graphically illustrated listing of the more than 15,000 items in the Appleton Line—all "STANDARD FOR BETTER WIRING." The Appleton Catalog will be mailed to any user of wiring and lighting equipment immediately upon request.

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APPLETON ELECTRIC COMPANY

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Branch Offices: NEW YORK, 50 Church Street • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 724 Boulevard, N.E. • BIRMINGHAM, 429 Brown-Marx Bldg. • MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant Street • BOSTON, 10. High Street • DENVER, 1509 Seventeenth Street • PHILADELPHIA, 1017 Cherry Street

Resident Representatives: Cincinnati, Dallas, Houston, Indianapolis, Kansas City, Milwaukee, Seattle

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APPLETON ELECTRIC PRODUCTS

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

America's Choice

CHEVROLET ADVANCE-DESIGN TRUCKS

for All-Around Value!

Ask the experts—

If you ask the drivers, they'll say:

"Chevrolet Advance-Design Trucks can and will take it day after day, month after month. They're easy to handle . . . built with driver safety and comfort in mind."

The mechanics insist:

"Chevrolet trucks last longer because they're designed, engineered and built for the job. They're easier to work on . . . built with an eye to economical maintenance."

The owners will tell you:

"Only Chevrolet has the TRIPLE ECONOMY of low cost operation . . . low cost upkeep . . . and the lowest prices in the entire truck field."

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT 2, MICHIGAN

Only the Leader — Chevrolet has all these features:

NEW CHEVROLET 4-SPEED SYNCHRO-MESH TRUCK TRANSMISSION

A special feature in one-ton and heavier duty models that assures new operating ease and efficiency.

THE CAB THAT "BREATHES"

Here are the trucks with the famous cab that "breathes"! Outside air is drawn in and used air is forced out! Heated in cold weather.*

FLEXI-MOUNTED CAB

Chevrolet's Advance-Design Cab is mounted on rubber, cushioned against road shocks, torsion and vibration.

IMPROVED VALVE-IN-HEAD ENGINE

The world's most economical engine for its size now has greater durability and operating efficiency.

SPLINED REAR AXLE HUB CONNECTION

Greater strength and durability in heavy-duty models with this exclusive Advance-Design feature.

PLUS Uniweld, all-steel cab construction • New, heavier springs • Full-floating hypoid rear axles on ¾-ton and heavier duty models • All-round visibility with rear corner windows* • Specially designed brakes • Hydrovac power brakes on two-ton models • Ball-bearing steering • Double-line pre-selective power shift in 2-speed axle at extra cost on two-ton models • Wide base wheels • Standard cab-to-axle-length dimensions • Multiple color options.

**Heating and ventilating system and rear corner windows with de luxe equipment optional at extra cost.*

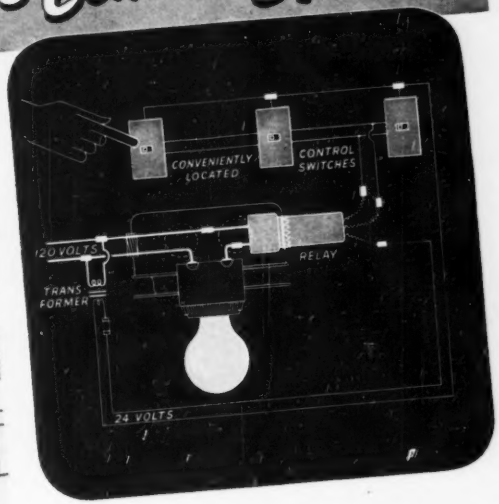
CHOOSE CHEVROLET TRUCKS FOR TRANSPORTATION UNLIMITED

CHEVROLET

Light the path ahead

WITH SQUARE D's NEW Low Voltage Control System

use this
Remote Control Relay System
instead of conventional switching
for greater
CONVENIENCE · SAFETY · COMFORT
. . . at very reasonable cost



LIGHTS OFF IN GARAGE
AND ON IN KITCHEN

LIGHTS OFF BEHIND
AND ON AHEAD

LIGHTS ON FOR A LOOK
THEN OFF ALL OVER

• The above sketch shows how remote control relays are installed in knockouts of outlet boxes. The relays are controlled from any number of conveniently located switches operating on a 24 volt system. Only the load circuit wiring is at 120 volts.

One relay can be operated by several control switches, or several relays can be operated from one or more locations, using master switches.

Write **for Bulletin No. 1008, which gives details of this simple, low-cost way to adequate switching.**

Square D Company,
6060 Rivard Street, Detroit 11, Michigan

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SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S. A., MEXICO CITY, D. F.

LOOK AT WIRING

This Way

NE WIREWA goes up fast

The hinged couplings add rigidity to sections for lifting into place, and serve as hangers. There are fittings for every possible installation requirement.

It's easy to see why plant men like NE 4x4 WIREWA for protecting wiring—for wiring that may be changed, tapped or spliced frequently. NE WIREWA provides *steel protection* plus *accessibility*, unequalled by any other type of wiring raceway. Besides, WIREWA is easy to install.

Wiring may be readily inspected any time by simply opening the hinged lids. And the 16 square inches of cross section allows ample room for adding circuits, splicing, tapping and other work. There are plenty of concentric KO's, too, for conduit take-offs.

Low maintenance . . . simple to re-route and extend . . . 100% salvable.

Write for a copy of "A Wirewa You'll Like." It contains installation data and lists all fittings. We'll gladly send you a copy.

National Electric
PRODUCTS CORPORATION
PITTSBURGH 30, PA.

NATIONAL ELECTRIC PRODUCTS
NE
WIRING SYSTEMS 6
WIRES AND CABLES

MUST Reading for Congress

LEGISLATION involving federal public power policy is before Congress once again. Proponents of public ownership are about as eager for some power policy change as private ownership people have been. So it isn't difficult to imagine that new power law will be written. We can guess its direction.

Before Congress makes any change in existing power law, ELECTRICAL WORLD hopes its members will read an article in this issue—"Garden in the Desert." This tale is a companion to one published last Aug 14—"One Less River to Boss." As the latter told the story of the private development of the Wisconsin River, "Garden in the Desert" is a story of the cooperative development of the Central Snake River Valley by the U. S. Bureau of Reclamation and the Idaho Power Co. Whatever else it finds in the story, Congress can learn that joint development of a river is possible and that it can pay dividends—in cash, human happiness, resources conservation, a broader tax base, national defense, new homes, and greater real wealth.

The record in Southern Idaho shows all these dividends. It shows a long history of government capital and risk capital combining their efforts to make exactly what the title of our story calls it—a garden in the desert. If any man need be convinced of the wisdom of land reclamation, let him look at the prosperous and productive irrigated tracts of the Central Snake Valley, ringed so endlessly by the sagebrush wasteland, and satisfy himself. If any man need be convinced that the electrical development of an area can wisely be left to those who do it for a profit, let him look at the record of electrical development in Southern Idaho and compare it with the record compiled anywhere else in the world.

If any man be convinced that cooperation in Southern Idaho is of no consequence, let him look at comparable situations elsewhere in this country. He need only survey the joint operations of private power and government power, say, in the Pacific Northwest, in California's Central Valley, in the Southwest, in Tennessee, to find a big and, we believe, unwholesome difference.

Such a man would find, specifically, that Snake River development work has encouraged investment of risk capital in power generation. The Pacific Northwest for a decade saw a vendetta against such participation of risk money. In part as a result, the Pacific Northwest has a power shortage today. Southern Idaho has none. Specifically, he who inquires will find that Central California's electrical supply is deeply involved in a tangle whereunder 350,000 kw of capacity are available only on a day-to-day basis, directly the result of a failure to institute there the cooperative development which has blessed Southern Idaho. If there be any value to "Garden in the Desert," it will lie in the demonstration that, in one of this country's less promising territories, tax capital and risk capital do work side by side and do a real job for the public. If this can be done under the adverse conditions of this American desert, who will deny its possibilities in other, better endowed localities?

The story of the Snake is one that neither Congress nor the public can afford to overlook.

That TVA Steam Plant Again

TVA's back in for the New Johnsonville appropriation, and its prospects are better than last year's. But that doesn't mean its case has improved. If the argument be that the plant must be ok'd this year to avoid power supply disaster three years hence, the answer remains that municipalities or industrials can build the stipulated capacity as rapidly as TVA. If the argument be that opponents of New Johnsonville are trying to put an industrial stranglehold on the Tennessee Valley, the answer remains that the opponents are trying to extricate themselves from having to pay—through taxes—for the instruments with which the Tennessee Valley would undertake industrial pillage. Wherever you turn, the arguments and the answers remain the same. Only the political considerations are altered. That change has been heavily in TVA's favor.

This being so—and assuming that the privately-owned power industry still opposes federal steam generation—the time for the power business to get humping is now. One way to get humping is for the leaders who ducked last year to stand up and shout this year. Another way is for the industry to use what ammunition it has in the locker. The National Association of Electric Companies has issued a pamphlet which lays out the New Johnsonville debate pretty thoroughly. It would be a shame for the industry to lose the New Johnsonville fight through failure to use the NAEC pamphlet.

Federally Owned Steel Plants

MUCH of the editorial trade has been knocking itself out recently on President Truman's recommendations regarding federal steel capacity. But we learn that the issue isn't steel alone, but, more importantly, productive capacity levels.

Supporters of the President's plan, we hear, want to establish a fundamental concept: That the people's need for basic productive capacity shall not depend solely upon management decisions. That is to say, if management of a basic industry, for whatever reason, determines not to expand as fast or as far as government thinks it should, then government will have and use the right to enlarge capacity in that industry.

This concept, we learn, is by no means limited to steel. It covers—even though they may not yet have been mentioned—the underlying necessities of American economic existence as we know it today. In thinking, if not in immediate action, such a concept must cover petroleum, power, rubber, copper, aluminum, transport, coal, and food as well as steel.

Any such concept, obviously, goes far beyond whether the government shall make steel. It certainly has a real national defense aspect, although we're told that its backers aren't using national defense as a cloak for their far-reaching thinking. Rather, and the record so far bears this out, they're claiming that "this is what the people voted for Nov. 2" after having tasted—and apparently enjoyed—the same philosophy for the last 16 years.

For the power business, Mr. Truman's steel plans mean that more industry is entering the federal-competition arena. Maybe the newcomers will be allies even if involuntarily so.

Technical Graduates in Power Plants

IT IS ESTIMATED that an average of 4,000,000 kw of capacity must be added to American electrical systems each year for the next ten years. This extraordinarily large increase can only be realized by the construction of many new plants as well as by additions to older stations.

Such development of power generating capacity offers a splendid opportunity for service to young technical graduates from our engineering schools. While this field lacks the glamour of other fields, it has the advantage of continued substantial growth and permanence.

This spring the interviewer of graduates for utility employment can strengthen his arguments by outlining the many opportunities which the field presents.

An engineer specializing in power development need never go stale. There are continuing problems in the maintenance and improvement of production efficiency in present-day plants. He also will have to deal with labor relations, and in this connection, weigh the advantages of automatic operating equipment against hand control.

Practice in power development is changing continuously. Increased fuel prices and wages are leading to the use of new thermal cycles employing higher pressures and temperatures. These involve the development and use of new metals, changes in feed water treatment, and improved methods of burning fuels. The need of using lower-grade fuels poses added problems to the technical man.

Other developments appear to be pending, such as the use of gas turbines for electrical developments. This promising unit eventually must be built to operate on coal, probably on some new cycle yet to be worked out. Such plants will challenge the best ability of our engineers.

Finally, the successful operation of atomic power plants will require the highest skill of the engineers in charge. It is too early yet to detail the problems such engineers will encounter, but they will be new and varied.

Immense developments lie ahead, and opportunities are presented for permanent and useful employment in an essential national industry.

The State of the Nation

We can't resist comment on Mr. Truman's "acute shortage of electric power."

The President certainly is going to be surprised when he sees what happened to the peaks last month. The point isn't earthshaking. It's just more proof that on power, he still doesn't know, doesn't want to know.

The Electrical Week

More electrical home appliances were sold in 1948 than in any previous year. What is more, *Electrical Merchandising* concludes that fewer will be sold this year . . . While President Truman was warning Congress of power shortages, Edison Electric Institute did a little checking and learned that power capacity reserves last December reached 5.1%, higher than had been expected. Curtailments for all reasons at the time of peak load totaled only 0.7% . . . However, the President will have still more public power facilities if Congress accepts his budget recommendations. Every agency concerned with power, except REA, was on the list for increased funds . . . REA, though, will spearhead the President's drive. Two major loans have been made, one to a Minnesota co-op for a 11,500-kw steam plant, the other to a South Carolina co-op for 834 miles of transmission lines . . . And from Hotpoint, Inc. comes the good news that the cost of installing electric ranges is coming down.

A report from France indicates that the production of electric power has been satisfactory since the utilities have been nationalized, but politics has been seen in the administration of the nationalized companies.

Five measures which if adopted by Congress might cause a depression were listed recently by Charles E. Wilson, president of General Electric Co, as (1) a revival of the excess profits tax in peace time, (2) higher taxes on individual incomes, (3) rationing or allocation of materials, (4) price control, and (5) a fourth round of wage increases.

If the theory that the West Coast gets the East Coast's weather one year later holds true, there won't be any water shortage plaguing the West in 1950.

There is considerable conjecture over the failure of the aluminum industry to activate some of the idle potlines in various sections of the country. Lack of power is the excuse offered. Fact is that these potlines are located in areas where power costs would be about 8 mills per kwhr. Most energy used for aluminum reduction costs approximately 3 mills. Every increase of one mill in the price of power means an increase of 1 cent per pound of aluminum. Eight-mill power thus would mean a 5-cent per pound price increase. But isn't the aluminum industry paying 27 cents per pound for European scrap?

Edison Electric Institute figures that the average annual energy consumption of an electric covering is 140 kwhr. Since the increase in energy consumption by the average residential consumer was 112 kwhr in 1948, utilities might profitably show more interest in this off-peak appliance.

J. M. Baldwin, city manager of Ocala, in sunny Florida, following a breakdown of the municipal distribution system because so many consumers were using electric heaters, is quoted in a local paper as follows: "If the distribution system was enlarged to care for a large number of electric heaters, the system would be operating most of the year at a low capacity. No city or power company could economically afford to operate in that way."

Utilities may be interested in knowing that the Bureau of Federal Supply has decided that the oil in government trucks and cars is to be changed only every 4,000 miles.

O. John Rogge, former U. S. Assistant Attorney General who was interested in the Progressive Party campaign, has been retained by the CIO Electrical Workers in their suits against General Electric Co. and the AEC to preserve bargaining rights over atomic workers.

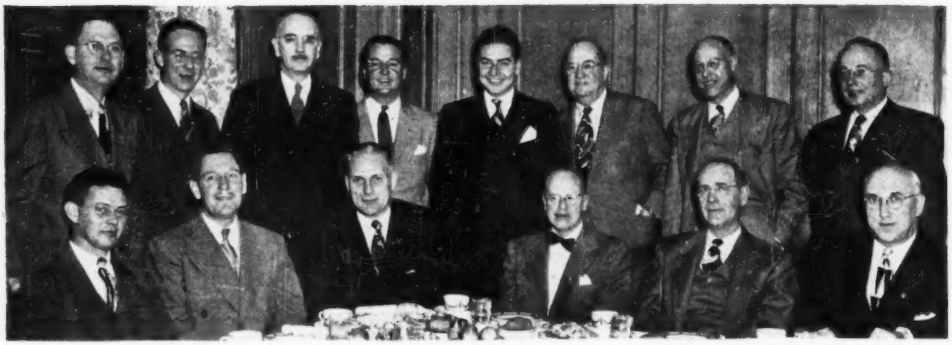
The American Iron and Steel Institute reports that the making of cyclotrons, essential to atomic research, is now an established industry. Cyclotrons require an immense amount of steel. One now being constructed will require over 10,000 tons.

Mt. Wilson, Calif., is considered one of the two most ideal spots in the United States for television and FM broadcasting. Programs sent from the seven television and five frequency modulation stations at its 5,000-ft height reach almost 6,000,000 people.

Russia, which supplies 35% of the manganese used in the United States, has been refusing to renew contracts with U. S. importers. If Russia drops out of the market, all American industries depending on steel will suffer.

Notes From The News

Alabama will have its own "TVA" if present plans of Governor Folsom materialize. He has suggested to the Legislative Council that such an agency be set up to generate and distribute low-cost electricity generated by proposed plants on the Coosa and Tallapoosa Rivers . . . Westover Station of the New York State Electric & Gas Corp has been renamed Goudey Station as a tribute to William B. Goudey, a retired vice-president . . . Seattle City Light sold an estimated 1,100,000,000 kwhr of energy during 1948 for $13,029,000, both record totals . . . Indianapolis Power &



OFFICERS AND DIRECTORS of the Public Utilities Advertising Association, who have completed plans for the annual convention, June 20-21, at Cincinnati. Left to right, seated, L. E. Gill, New Orleans Public Service, Inc; P. L. Penfield, Detroit Edison Co; H. Briggs, president, Philadelphia Co; J. E. Canfield, third vice-president, Wisconsin Power & Light Co; F. I. Fairman, first vice-president, Kentucky Utilities Co and H. S. Metcalfe, West Penn Power Co. Standing, J. S. Spalding, Southern California Gas Co; C. D. Lyon, secretary, Potomac Edison Co; W. G. Heren, Union Electric Co of Missouri; C. Fred Westin, Public Service Electric & Gas Co; W. B. Hewson, second vice-president, Brooklyn Union Gas Co; K. Fitzpatrick, Jr, Dayton Power & Light Co; E. R. Keller, Cincinnati G & E Co; and J. L. Humphries, Ohio Fuel Gas

Light Co has placed on display in the lobby of its main office a model of its White River power plant at Centerton, Ind., which is now under construction.

Staff investigators for a Congressional committee have given high praise to the labor relations of the Tennessee Valley Authority. In its 15 years, TVA's relations with labor "have been relatively free of strife and discord" . . . Like a Chinese light bill read that of an Estherville, Iowa, consumer. Something happened to a billing machine and the bill was for $1,188,005.56 instead of $5.56 . . . So that a 4-year-old boy who is going blind could have electric lights on the last Christmas tree he will be able to see, Columbus & Southern Ohio Electric Co rushed construction of an emergency 1.5-mile line to the boy's home . . . President Truman has asked Congress to nullify action of the 80th Congress in ousting Michael Straus, Reclamation Commissioner, and Richard L. Boke, regional Reclamation director in California.

Philo Plant of Ohio Power Co broke all its former production records in 1948 with an output of 2,950,992,930 kwhr . . . Visitors who took the guided tour of Hoover Dam in 1948 numbered 407,980, a decrease from the 424,175 of 1947. However, visitors came from 48 foreign countries, an increase from the 41 of 1947 . . . Theft in South Carolina has reached a new high. About 1,000 ft of live conductor along with pole line hardware were stolen from the Blue Ridge Electric Cooperative. But police promptly arrested three men and recovered the stolen property . . . Philadelphia Electric Co has announced that its 1948 output was 8.05 billion kwhr, 6.4% greater than in 1947. Record peak of 1,557,000 kw was set on Dec 15.

Construction:

Puerto Rico has dedicated its Caonillas Dam as the major link in a proposed power system. The plant will have two 11,000-kw units . . . Florida Power & Light Co has announced a $29,188,200 construction program . . . Omaha Public Power District will spend $155,000 to reduce its fuel cost through fighting waste from smoke . . . Gulf States Utilities Co has energized the first link of a 132-kv line which when completed will connect its generating stations at Baton Rouge, Lake Charles, and Beaumont . . . The Federal Power Commission has suspended consideration of the Idaho Power Co's application to start work on Oxbow Dam on the Snake River until Congress acts on the Hell's Canyon Dam proposal.

A federal survey of power possibilities in the Merrimack and Connecticut River basins has been asked by Republican Senator Lodge of Massachusetts . . . To end power troubles in Urbana, Ohio, Dayton Power & Light Co will run a direct line from Dayton to the city . . . Iowa-Illinois Gas & Electric Co, Rock Island, Ill., has started action to condemn the land needed for right of way for a 161-kv transmission line from Des Moines to Fort Dodge . . . Gothenburg, Sweden, is building water and electrical plants in caves blasted in the mountains.

Financial:

Roanoke River Power Co, a subsidiary of the Carolina Power & Light Co, has been dissolved. The company was formed to acquire land for a hydroelectric plant at Buggs Island . . . Boston Edison Co has increased its quarterly dividend on common from 60 to 70¢ a share . . . Monongahela Power Co will issue $6,000,000 of new mortgage bonds to be sold publicly and $1,000,000 of common stock for sale to its parent, West Penn Electric Co . . . Paducah, Ky., will vote on a date yet undecided on the issuance of revenue bonds to pay $2,604,109 for the electric properties of Kentucky Utilities Co.

Sales and Retail Value of Electrical Appliances Sold, 1947 — 1948[1]

Product	1947 Number Sold	1947 Retail Value ($)	1948 Number Sold	1948 Retail Value ($)
Air conditioners			90,000	40,500,000
Bed coverings	550,000	23,650,000	650,000	27,950,000
Blenders			235,000	8,930,000
Broilers			250,000	4,987,500
Cleaners, vacuum				
Floor type	3,800,687	285,368,000	3,500,000	268,345,000
Hand type			295,000	7,839,000
Clocks	9,645,000	70,312,000	10,500,000	78,750,000
Coffee makers				
Metal	200,000	4,000,000	600,000	12,000,000
Glass	4,500,000	42,750,000	2,000,000	23,000,000
Dishwashers	100,000	23,500,000	225,000	61,875,000
Disposers	100,000	12,500,000	175,000	19,250,000
Dryers, clothes	58,000	12,180,000	75,000	17,625,000
Fans, all types	2,790,000	60,455,000	3,155,000	77,235,000
Freezers, home	450,000	129,150,000	675,000	202,500,000
Heaters, radiators	1,865,600	26,110,000	1,300,000	16,900,000
Heating pads	2,369,000	16,204,000	1,600,000	10,800,000
Hot plates, grills	750,000	4,125,000	550,000	5,472,500
Ironing machines	599,250	75,821,800	470,000	65,221,900
Irons	9,400,000	100,046,000	6,500,000	80,925,000
Lamp bulbs and tubes				
Total	1,705,041,000		1,831,000,000	

Product	1947 Number Sold	1947 Retail Value ($)	1948 Number Sold	1948 Retail Value ($)
Fluorescent	79,073,000		86,000,000	
Incandescent	831,239,000		850,000,000	
Photo	78,791,000		125,000,000	
Miniature	444,910,000		420,000,000	
Christmas Tree	271,028,000		250,000,000	
Mixers, food	1,450,000	49,300,000	1,750,000	69,912,500
Oil burners, total	820,923	986,532,800	450,000	
Radio receivers, total	18,500,000	1,251,444,500	16,000,000	1,216,550,000
AM receivers	17,094,000	854,016,250	13,650,000	586,950,000
FM-AM receivers	1,227,400	310,532,200	1,500,000	276,000,000
Television receivers	178,600	86,896,050	850,000	353,600,000
Ranges	1,200,000	276,000,000	1,600,000	376,000,000
Refrigerators	3,400,000	867,000,000	4,330,000	1,177,800,000
Roasters	365,000	13,140,000	610,000	22,875,000
Sandwich grills	1,700,000	27,200,000	1,450,000	23,925,000
Shavers	2,100,000	42,000,000	2,000,000	44,000,000
Toasters, total	3,700,000	62,890,000	4,875,000	88,213,750
Waffle irons	1,550,000	21,700,000	1,900,000	28,405,000
Washing machines				
Electric, standard	3,657,000	541,236,000	4,285,600	722,123,600
Electric, small	498,060	16,434,000	310,000	10,230,000
Water heaters, storage	1,100,000	143,000,000	1 040,000	143,000,000
Water systems	730,000	84,000,000	650,000	89,050,000

[1]*Courtesy Electrical Merchandising*

Appliance Sales Set Record in 1948

Manufacturers Met All Demands Except That for Refrigerators; Decline Expected This Year; Many New Electric Consumers Helped Bolster Market

MORE ELECTRICAL home appliances were sold in 1948 than in any previous year in the industry's history and, in all probability, more than will be sold in 1949, according to conclusions reached by *Electrical Merchandising*.

Production estimates compiled by the magazine from manufacturers' reports show that producers were able, for the first time since the war, to meet the demand for all major appliances except refrigerators. Every major type except the water heater showed substantial sales gains. Refrigerators, for which there was the largest backlog of demand, jumped more than a million units from the 1947 total of 3,400,000 to a 1948 figure of 4,330,000. Electric ranges went from 1,200,000 to 1,600,000. Washers, freezers, dishwashers, disposers, clothes dryers, and television receivers also piled up new sales records. All types of lamps except miniature bulbs continued their postwar sales climb.

On the debit side of the ledger, indicative of a return to "normal" market conditions, were electric storage water heaters, vacuum cleaners, AM radios, ironing machines, water systems, and numerous small appliances.

New customers added to power company lines during the year bolstered consumer demand built up during the war years. According to *Electrical Merchandising* estimates, a total of 35,205,360 domestic and farm utility customers were using power at the beginning of this year as compared with 33,050,000 in early 1948. *EW figures for these classifications are 35,262,600 and 33,144,045.*] The biggest gain was registered in urban electric customers, who at the beginning of this year totaled 23,551,140 as compared with 22,366,466 at the same time in 1948. Rural non-farm electric customers increased from 6,912,534 to 7,392,475 and farm electric customers from 3,771,000 to 4,261,745.

In response to a request by the magazine 203 power companies serving 25,683,797 residential and rural customers provided data on appliance merchandising in their territories. The two most important facts uncovered were (1) that the trend is for utilities to get out of appliance merchandising and (2) that the number of dealers has increased 76.4% over the prewar total.

At the beginning of last year 54.5% of the utilities were selling appliances. The latest survey reveals that the balance has shifted the other way; 53.3% of the companies do not merchandise appliances.

The shortages of generating capacity, the great increase in dealers, a lack of trained sales personnel, and insufficient supplies of merchandise have all contributed to utility decisions to let regular retail dealers handle appliance sales. As competition becomes keener and shortages of men, power, and materials vanish, some power companies may reverse themselves—as indeed two or three have at this writing—but it seems unlikely that the trend in general will change.

Utilities which continue to merchandise appliances in 1949 plan promotional campaigns for some of the newer

Appliance Shipments by Market Areas 1948

Region	Resid. & Rural Electric Customers Jan. 1, '49	% of U. S. Total	Shipments by Percent of U. S. Total (first eight months, 1948) Washers	Ironers	Refrigerators	Ranges	Water Heaters
New England	2,530,790	7.19	5.49	5.05	6.69	5.01	4.99
Middle Atlantic	7,659,220	21.75	17.92	18.24	20.85	13.09	13.45
East North Cent.	7,750,100	22.01	21.71	25.08	21.61	21.91	21.88
West North Cent.	3,294,600	9.36	10.82	10.32	10.19	11.55	13.42
South Atlantic	4,106,110	11.66	12.99	9.09	12.45	18.11	20.82
East South Cent.	1,987,600	5.65	7.01	3.69	5.71	9.36	8.03
West South Cent.	2,922,000	8.30	9.18	7.37	8.70	3.92	2.68
Mountain	1,117,810	3.18	3.52	4.55	3.34	4.93	5.25
Pacific	3,837,100	10.90	11.36	16.61	10.46	12.22	9.48
Total U. S.	35,205,260	100%	100%	100%	100%	100%	100%

Appliance Saturation, January, 1949

Product	No. Homes With	% of Wired Homes
Bed coverings	1,250,000	3.6
Blenders	450,000	1.3
Cleaners, vacuum, floor	18,200,000	51.7
Clocks	29,760,000	84.5
Coffee makers	17,550,000	49.9
Dishwashers	425,000	1.2
Disposers	375,000	1.1
Dryers, (elec. & gas)	175,000	0.5
Freezers	1,400,000	4.0
Heaters & radiators	7,650,000	21.7
Heating pads	9,640,000	27.4
Hotplates	6,157,000	17.5
Ironing machines	2,856,000	8.1
Irons	32,047,000	91.0
Mixers	8,400,000	23.9
Oil burners	4,000,000	11.4
Oil space heaters	5,000,000	12.5
Radio receivers[1]	37,623,000	94.2
Ranges	5,840,000	16.6
Refrigerators	26,967,400	76.6
Roasters	2,493,000	7.1
Sandwich toasters	9,040,000	25.7
Shavers	9,250,000	26.3
Television receivers	1,037,000	2.9
Toasters	22,712,000	64.5
Waffle irons	10,020,000	28.5
Washers, electric	23,742,000	67.4
Water heaters, storage	3,161,000	9.0

[1] Radio, oil space heater figures based on 39,950,000 total homes. All other figures based on 35,205,000 domestic and farm electric customers.

appliances as well as the old standbys. Forty-two percent will run specific campaigns on ranges and water heaters. 40% will promote home freezers, and 25% have indicated they will conduct educational and pioneering campaigns on electric clothes dryers.

Percentagewise, the increase in the number of dealers reported by the utilities is somewhat smaller this year than last in relation to the number of dealers before the war. The decline, just 1%, from 77.4 to 76.4, is not particularly ominous in itself. There are indications, however, that with a return to normal competition and a consequent increase in sales costs, many dealers, particularly the newer ones, will have to struggle for their very existence.

While appliance supply is generally considered to be near normal in most metropolitan areas, the replies of utility companies on this question show no such picture for the nation as a whole. Seventy-two percent of the responding companies, 141 out of 190, declared that appliance deliveries in their areas are not yet at a normal level.

Despite the year's unparalleled sales records, an overwhelming majority of utility officials, 79.8%, expressed a belief that consumers are evidencing resistance to the upward spiraling prices of appliances.

By the end of 1948 the most apparent fact in the appliance industry was that the day of easy sales was dead. Declines in sales of some items, shutdowns and layoffs by manufacturers, widespread price cutting in some metropolitan areas, an incipient increase in dealer failures, and a growing search for salesmen all pointed to stiffening competitive conditions.

Capacity Reserve Above Forecast As Industry Passes Winter Peak

THE FIGURES this week bore out the year-end speculation that power capacity reserves for the December, 1948, peak were higher than had been anticipated.

As President Truman studded three New Year messages to Congress with warnings of power shortages ranging from "acute" to "anticipataed," reports from "90% of the nation's central station power capacity showed:

Reserve Tops 1947 by 25%

1. An actual reserve margin of 5.1%, slightly higher than last year's actual margin and 25% above the margin predicted by Edison Electric Institute for this winter's peak-load season. The National Security Resources Board had issued a report predicting a 3.4% reserve margin under median hydro conditions.

2. Curtailments, at the time of peak load last month amounting to 0.7% of the peak load and practiced in four of eight power supply regions.

Not included in the survey were about 6,000,000 kw of central station capacity —that operated by the Tennessee Valley Authority (approximately 3,000,000 kw) and another 3,000,000 kw operated by municipals and similar small isolated systems.

By projection of the 50,500,000 kw of capaciity which was reported, the peak reached about 53,000,000 kw against a nameplate installed capacity of about 56,350,000 kw.

Reserve Margin Held Down

Two factors combined to hold down the reserve margin. One was the fact that on many systems, the December peak load occurred earlier than was anticipated. Thus, certain capacity which was operating at the time of the anticipated peak had not been operating at the time of the actual peak. Also, equipment out for maintenance at the time of the actual peak was not included. To the extent that this equipment was back in service at the time when the peak had been expected, the reserve margin could have been greater.

What little curtailment was reported by the utilities surveyed came as follows:

1. Voltage regulation in two power supply regions totaled 0.33% of the peak.

2. Shifting of load to off-peak periods accounted for 0.167% of the peak.

3. Voluntary curtailment accounted for 0.2% of the peak.

In "three or four places," EEI reported, curtailment was due to equipment outtage, in "a few others" it was due to precautionary measures lest the demand exceed capacity, and in "a half dozen localities" it was due to excess of demand over capability.

The 1948 peak demand was up about 7% over that of the previous year. In 1947, the peak was 10.1% higher than in 1946. Another 7% increase is anticipated for 1949.

Capacity in place at the end of the year is still not known precisely. But it was known to have reached 56,336,000 kw by mid-December, with the possibility that a few more units might have come on the line before the year's end, but with no adjustment for equipment scrapped during that month.

EEI declared that 4,250,000 kw were installed during the year. Retirements through November, according to FPC, totaled 86,518 kw. At the end of 1947, 52,211,488 kw was in operation.

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Fuel-Cost Rate Basis Denied to Kentucky Utility

The first request by a Kentucky public utility for permission to insert a fuel-cost clause in its rates to residential customers has been denied by the Public Service Commission. The utility was told it could submit evidence of need for higher rates.

Community Public Service Co had sought a fuel-cost basis for both residential and commercial users. The utility buys its current from the Kentucky Utilities Co and Union Light, Heat & Power Co under such contracts. It was estimated the proposed raise would have added $42,000 a year to Community's income. The company declared increased costs have reduced its earnings to 3% on its investment. It serves approximately 8,800 consumers in more than 20 cities.

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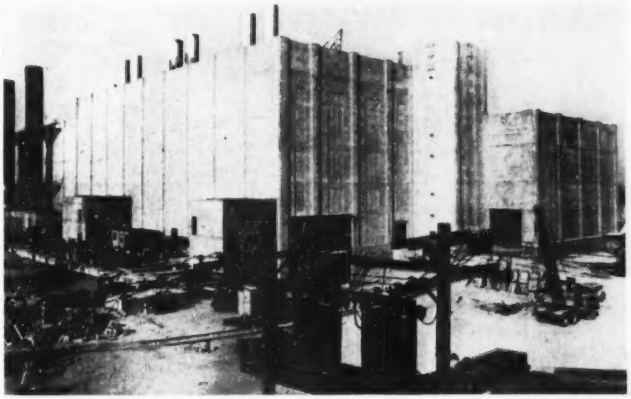
Negotiate Ontario Sale

Negotiations are under way for purchase of the Kaministiqua Power Co by Ontario Hydro Commission. The plant, which serves Fort William and Port Arthur, is located about 20 miles west of the former on the Kaministiqua River and has a 32,000-hp capacity. If the sale is made, the plant will be tied in with the Commission's Thunder Bay system.



NEARING completion is Los Angeles Department of Water & Power Harbor Steam Plant. Fourth and fifth units to be added this year will raise capacity to 355,000 kw

President's Budget Message Asks Unprecedented Spending for Power

PRESIDENT TRUMAN asked Congress to finance federal power operations on an unprecedented scale in his annual budget message this week.

Actual costs, next year and in the future, of electric power facilities contemplated for fiscal 1950 were buried in a welter of budget estimates for multiple-purpose projects. But by almost any conceivable method of comparison, they looked bigger than ever before.

Out of total federal expenditures of $41,900,000,000 anticipated for the year, civilian public works, which include federal power construction, will take $2,200,000,000 of new appropriations. With carry over money from previous appropriations and other funds, however, the federal government will spend nearly $3,000,000,000 for actual construction.

On the basis of funds to be provided by Congress for the fiscal year, the power programs look even larger. With a few exceptions—notably the Rural Electrification Administration—federal agencies involved in construction of electric power facilities or other power activities were slated for record appropriations. The President asked for $2,404,000,000 in appropriations and contract authorizations aggregating $451,300,000 for such bureaus.

Even REA, which was put in for new loan authorizations of $350,000,000—its 1949 allotment was $400,000,000—got a better break on its lending program than indicated. An anticipated carryover of previous loan funds will raise this to $469,000,000.

Power shortages in several areas, the President warned, are of a "permanent" nature. He thus justified more money for power construction by the Army Engineers, Reclamation Bureau, Bonneville Power Administration, and the Tennessee Valley Authority.

Most of the proposed 1950 work of these agencies will involve continuation of present projects. But five major new power developments are included. They are as follows:

1. TVA's New Johnsonville steam generating plant, for which the President wants $3,000,000 (out of a TVA supplemental appropriation of $3,450,000) before next June 30, and $16,500,000 in fiscal 1950. Estimated cost of the plant is $54,000,000.

2-3. Two Pacific Northwest power and navigation projects of the Army Engineers, the $205,000,000 Chief Joseph Dam (formerly Foster Creek) on the Columbia River, and the $86,000,000 Ice Harbor Dam on the Snake. Initial appropriations of $5,000,000 for Chief Joseph and $12,000,000 for Ice Harbor were asked.

4. The St. Lawrence Seaway and Power Project, for which Congressional authorization will be asked later, $20,000,000, of which $8,000,000 would be spent in fiscal 1950, to start the Seaway.

5. Reclamation Bureau's Delta steam generating plant in California's Central Valley. To acquire land, start plans, and complete other preliminaries, the President requested an initial $2,000,000. Total cost of the 240,000-kw plan is estimated at $32,000,000.

The budget also includes Interior Department programs halted, or sharply curtailed, by the 80th Congress. It would revive the fading Southwestern Power Administration with a $4,000,000 appropriation and contractual authority of $5,800,000. SPA would spend $525,000 for operating, maintenance, and other administrative costs, the rest for construction. An indefinite amount is allotted for transmission facilities from the Army's Bull Shoals, Fort Gibson, and Tenkiller Ferry projects. Initial power operations at all three are scheduled for 1953.

Survey Staff Proposed

The budget also would set up a staff in Interior to make power surveys and market energy to be produced at Army projects "east of the Mississippi River." Interior would get $85,000 for this purpose next year. Its Division of Power also would receive $81,300 under the new budget, as compared with $50,000 this year.

BPA was allotted $33,000,000 in appropriations and $18,500,000 in contract authorizations. Corresponding sums this year were $21,583,200 and $11,888,500.

Bureau of Reclamation is slated for its largest appropriation, $379,593,500, as against this year's record $252,882,094. It is slated to spend $322,000,000 in fiscal 1950, about 25% more than the $258,000,000 it is expected to pay out this year.

Bulk of Reclamation's money would go into these six big projects: Missouri River Basin, $87,150,000; Columbia Basin, $69,500,000; Central Valley, $63,000,000; Davis Dam, $38,739,000; Hungry Horse Dam and power plant, $24,000,000; Colorado-Big Thompson, $21,500,000.

Record Sum for Engineers

The Army Engineers also were listed for record appropriations—$505,000,000 for flood control and $249,000,000 for the rivers and harbors program. This year they got $580,600,000 for these two programs.

The Engineers are slated to start few entirely new projects. Funds to continue major Army dams with provision for power installations were recommended as follows: McNary, Ore., $40,000,000; Fort Peck, Mont., $3,400,000; St. Mary's River, Mich., $3,000,000; Jim Woodruff, Fla., $8,900,000; Garrison, N. D., $31,000,000; Wolf Creek, Ky., $20,200,000; Buggs Island, Va.-N. C., $16,500,000; Clark Hill, Ga., $14,500,000; Fort Gibson, Okla., $14,000,000; Whitney, Tex., $14,000,000;

Fort Randall, N. D., $25,500,000; Pine Flat, Calif., $8,600,000; Allatoona, Ga., $7,148,700; Center Hill, Tenn., $7,000,000; Narrows, Ark., $4,650,000; Folsom, Calif., $3,500,000; Oahe, S. D., $2,000,000.

The budget provides TVA a 1950 program of $135,175,000, with $56,409,000 provided by new appropriations and the remainder from the agency's revenues. Of this amount, $49,583,000 would be applied to power facilities. Besides the New Johnsonville plant, TVA would spend $5,942,000 to continue work on six hydro generating units, $8,008,000 to start work on another six, and $19,133,000 for transmission and other power facilities. In addition, it would use $1,018,000 to complete Watauga Dam and $10,756,000 on construction of South Holston.

The two regulatory agencies concerned with electric utilities came in for slight increases. Federal Power Commission was slated for $4,240,000, as against $4,077,450 in 1949, and Securities and Exchange Commission went in for $5,970,000, compared with this year's $5,826,140.

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Winter Water Diversion Will Aid Ontario Hydro

Ontario's Hydro-Electric Power Commission will get additional water for one of its heavily burdened hydro plants. The State Department has announced that Canada and the United States have agreed on emergency diversion of 2,500 cfs through the Welland Canal. The diversion, to continue only during the winter non-navigation season will be used at Ontario Hydro's Decew Falls Plant, near St. Catherines.

At the same time, the United States agreed to continuation of a "temporary" diversion of 4,000 cfs from the Niagara River to Canadian plants on that stream. The latter diversion started in 1944 as a wartime step to boost power generation of the Ontario plants.

The Welland Canal diversion was requested by Canada in October as a means of partially alleviating the critical power shortage in southern Ontario. Water will be taken for the purpose from Lake Erie during a period when there is no shipping traffic through the canal.

Both diversions are scheduled to terminate not later than April 15, 1951.

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Utility Consolidates Office

Southwestern Electric Service Co has completed consolidation of its central office at Jacksonville, Tex.

REA Spearheading Public Power Drive, Makes 2 Generating Loans

RURAL ELECTRIFICATION Administration has taken over as a voluntary spearhead for President Truman's drive to expand federal electric power operations.

REA Administrator Claude Wickard sounded the keynote for the agency's new role in a speech this week, (Jan 11) in Nashville, Tenn. Addressing a statewide meeting of REA co-op representatives, Wickard specifically endorsed the President's renewed demands for funds to build Tennessee Valley Authority's projected New Johnsonville thermal generating plant.

Says Fuel Plant Needed

"Supplementary fuel plants" are often desirable, Wickard asserted, in conjunction with hydroelectric projects to increase the output of "low cost" energy. He condemned the failure of the 80th Congress to approve funds for New Johnsonville last summer as a "short-sighted action."

He also endorsed construction of federal transmission lines where needed and large-scale expansion of federal hydro plant capacity.

Meanwhile, the lending agency announced two major loans, one for new generating facilities in Minnesota and the other for a cooperative-owned transmission system in South Carolina.

REA approved a loan of $6,500,000 to the Rural Cooperative Power Association, Maple Lake, Minn., on Jan. 11. The co-op, which has several generating plants, will use $2,480,000 of the amount to erect an 11,500-kw steam generating station at an as yet undetermined site.

To Buy Diesel Unit

The co-op will also spend $526,000 of the loan for a 2,250-kw diesel electric unit for installation in an existing plant. It will build 30 substations at a cost of $900,000, and it will spend $2,180,000 for 383 miles of 69-kv and 34.5-kv transmission lines.

The $7,595,500 REA loan to the recently organized Central Electric Power Cooperative, Columbia, S. C., had been expected for several weeks. It will finance construction of 834 miles of transmission lines in central South Carolina to supply public power to 14 REA-financed electric distribution co-ops.

The new lines will be utilized to carry energy from South Carolina Public Service Authority's Santee-Cooper hydroelectric project at Monck's Corner. The Authority will operate and maintain the new lines, integrating them with the co-ops' existing transmission system. It has agreed to pay Central Electric an annual rental sufficient to amortize the REA loan within 35 years.

The loan also will finance construction of five large substations at Pinewood, Sampit, Leeville, Neeses, and St. George and provide a two-way radio system for servicing the lines.

REA reported the co-ops will pay 6 mills per kwhr for Santee-Cooper energy delivered over the new lines at the co-op load centers. The co-ops now are buying energy at wholesale at rates averaging 6½ mills, REA reported. Total savings to the co-ops will amount to $122,000 annually when the new facilities are completed in 1951, they estimated.

Principal suppliers of wholesale energy to the co-ops have been three privately owned utilities—South Carolina Electric & Gas Co, South Carolina Power Co, and Carolina Power & Light Co. All three protested to REA last spring when the co-ops revived a nearly 10-year-old plan to build their own transmission grid.

The companies finally made two counter-proposals. First was to wheel Santee-Cooper power to the co-ops. If the Public Service Authority offered objections to this proposal—which it did—the companies then proposed to reduce their wholesale energy rates "substantially." REA termed both proposals "indefinite" as to service charges and amounts of energy which would be available to the co-ops in the future. The proposals also were "unsatisfactory" in other respects.

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Voters Must Okay Bonds

The Oregon State Supreme Court has ruled that a people's utility district may not issue or sell revenue bonds without approval of the qualified voters of the district. The decision was given in a case involving a bond issue by the Central Lincoln PUD, which had adopted an ordinance providing for the sale of $200,000 in revenue bonds. P. E. Fullerton, a patron of the district, brought suit in Lincoln County District Court to prevent the sale. The District Court Judge held approval by voters of the district was necessary, and the Supreme Court affirmed the decision.

Hotpoint Survey Reveals Decline in Electric Range Installation Costs

THE COST OF installing electrical ranges is declining and no longer is a serious deterrent to range purchases. This is the answer of those who should know best—some 10,000 consumer-purchasers of Hotpoint ranges between November, 1947, and November, 1948.

Hotpoint has been including a questionnaire with the book of instructions that goes with each range. In addition to a question on installation costs, there were others on the type of dealer patronized, reasons for patronizing a specific dealer, the replacement market, and range purchases as related to home investment.

From these questionnaires it was learned that the average cost for installing an electric range in 1948 was $40, an indicated decrease of $9 from the 1947 average. Industry sales of more than 1,500 000 electric ranges in 1948 supports the belief that installation costs no longer menace sales.

Underwriting Dropped

During the past year, Leonard C. Truesdell, vice-president of marketing for Hotpoint, Inc, noted, some utilities have discontinued underwriting range installation costs. This may indicate that public demand has now established the range as firmly as the refrigerator, eliminating the need for installation underwriting to encourage sales. The electric range has only a 14% saturation in wired homes, he said. While it is estimated that industry sales will continue to exceed a million a year in the immediate future, saturation will reach only 25% by 1960, statistics show.

The Hotpoint official said that 27% of the sales replaced gas ranges and 26% replaced ranges with other types of fuels. Twenty percent of the sales represented the first range purchased by the consumer. The average electric range replaced was well over 10 years old.

Brand Name Important

Brand name or reputation was listed by 55% of the purchasers as their reason for buying. Only 17% cited dealer contact or salesmanship as the determining factor in closing the sale. This, Truesdell said, indicated that "manufacturers must continue to train their dealers and support them with every selling aid possible."

Of the sales, 62% were made by appliance dealers, 12% by public utilities, 10% by furniture stores, 7% by department stores, 2% through plumbing and heating outlets, and 6% through other outlets.

Truesdell said that the price classification of the consumer's home supports marketing studies reveals that families earning $5,000 or more constitute the largest segment of buying power, so far as major appliances are concerned. The survey showed that 33% of the consumers valued their homes in the $6,000 to $10,000 classification. Only 9% lived in homes valued at more than $15,000.

Consumers in the farm market accounted for 20% of the purchases, and 25% lived in towns of 50,000 or more.

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T-H Denial of Bargaining to Foremen Is Validated

The Supreme Court this week reiterated its previously expressed view that Congress acted within its rights when it denied foremen collective bargaining protection under the Taft-Hartley law.

The court refused to review an appeal of the Foreman's Association of America attacking the constitutionality of the Taft-Hartley curb on the bargaining rights of supervisory workers in a case involving Edward G. Budd Manufacturing Corp, Detroit. The court took the same position last February when it denied a similar appeal of the same union involving L. A. Young Spring & Wire Corp, Los Angeles.

The Budd company, in a pre-Taft-Hartley decision of the National Labor Relations Board, had been ordered to cease discouraging membership in FAA and to reinstate a foreman discharged for alleged union activity. The U. S. Circuit Court at Cincinnati nullified all of the NLRB decision except that which directed reinstatement of the discharged foreman. The discharge violated the Wagner Act when it occurred in 1944.

The unaffiliated foremen's union has maintained a dwindling organization since it lost status under the Taft-Hartley Law a year and a half ago. It hopes to regain lost ground if a new labor law passed by the 81st Congress restores bargaining protection to supervisors. FAA President Carl Brown of Detroit told the union's convention in September that the T-H Law "stymied our organizational efforts."

Prospect on Capitol Hill is that new legislation will give bargaining protection to foremen, but may bar affiliation with other unions.

Zarem Is Eta Kappa Nu 'Outstanding Young EE'

Dr Abe Mordecai Zarem, manager and chairman of physics research for the Stanford University Research Institute, Los Angeles, has been selected as the "Outstanding Young Electrical Engineer of 1948" by Eta Kappa Nu, national honorary society for electrical engineers.

Jay Wright Forrester, associate director of the Servo-mechanisms Laboratory, Massachusetts Institute of Technology, Cambridge, and Milton E. Mohr, Bell

Fabian Bachrach Photo

DR ABE MORDECAI ZAREM

Telephone Laboratories, New York, received honorable mention.

The award is made annually "for meritorious service in the interest of their fellow men". To qualify, candidates must not be older than 35 years nor have been out of college for more than ten years.

Dr Zarem will receive his plaque at a Recognition Dinner on Jan 31, which will be held in conjunction with the general meeting of the American Institute of Electrical Engineers in New York.

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Dupuis Named to Board

Rene Dupuis of Montreal, chief engineer of Beauharnois Power Co, has been appointed to the board of the Quebec Hydro Commission. He replaces George C. McDonald, who resigned to return to private practice.

REA-Financed Systems Upped Sales 40.8% in '48

Rural electric power systems financed by the federal government added 468,900 new consumers on their distribution lines, put 147,000 miles of new lines into service, and sold 40.8% more power in 1948 than in the previous calendar year.

The Rural Electrification Administration announced these figures at the close of what it termed its "biggest year." The agency's estimates, based on data for the first nine months of 1948, emphasized the increased use of energy by both old and new consumers connected to REA-financed lines.

No breakdown of different types of sales was available. But average sales to both retail and wholesale consumers amounted to 2,097 kwhr per customer for the year. This represented an increase of 275 kwhr over the 1947 average.

The REA estimates also revealed that REA systems purchased 35.8% more energy, 5,052,000,000 kwhr as against 3,720,704,000 kwhr in 1947. At the same time the systems' power costs went up 40.1%, from a total of $37,219,806 in 1947 to $52,200,000 this year.

REA borrowers generated 60.2% more energy during the year, 694,000,000 kwhr, as against 433,282,000 in 1947. But this increased generation still represented only 12% of the total power used by the borrower systems. Installed capacity of REA-financed generating plants increased 17.9%, to a total of 217,000 kw.

Rising construction costs and extension of lines into sparsely settled areas ran up the investment in distribution facilities. Average cost of distribution lines increased 12.2%, to $1,366 per mile. Cost per consumer connected mounted 12.3%, to $447.

But total operating revenues of the systems increased 31.5%, from $114,878,798 in 1947 to $151,000,000.

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Detroit Rates Increased

Detroit Edison Co has been granted an increase in rates by the Michigan Public Service Commission. The increase, which will increase income by some $13,000,000 annually, is in two parts. The first reduced the discount for prompt payment of bills to 3% from the 4% that has been allowed since last July. This applies to all classes of consumers. The second allows the utility to apply a fuel cost clause to all classes of consumers except residential. This is the first rate increase for Detroit Edison in 27 years; there have been 52 rate decreases.

SEC RULINGS

Missouri Power & Light Co has been authorized to cancel $592,639 of indebtedness owing it by the Gasconade Power Co, Hermann, Mo. Gasconade, a subsidiary of Missouri Power, is to be liquidated and its assets distributed to its parent company after payment of its current liabilities. (Release No. 8754).

Mississippi Power Co has been authorized to sell $1,000,000 of first mortgage bonds, 3⅛% series, due 1978, to institutional investors at 98.58% of the principal amount, and an additional 50,000 shares of common stock. The common stock will be sold to Mississippi Power's parent company, the Southern Co. The subsidiary will use the proceeds of the sale for construction and improvements. (Release No. 8755).

Gulf Power Co, Pensacola, Fla., has received authorization to sell $1,000,000 of first mortgage bonds, 3¼% series due 1978, to institutional investors at 98.58. Gulf Power would use the proceeds for property additions. (Release No. 8760).

North American Light & Power Co's stock retirement plan was upheld when the commission denied a request of certain stockholders of the company to order it to pay a dividend in connection with the retirement of 960,992 shares of the common stock held by the public. According to the stockholders, North American Light & Power—since its amended plan of liquidation and dissolution was approved by the Federal District Court for the District of Delaware—received dividends of 60 cents a share on its holdings of the common stock of a subsidiary, the Illinois Power Co. Under the plan Light & Power proposes to retire its publicly held common stock by exchanging 3/10 of a share of Illinois stock for each share of Light & Power common outstanding. The stockholders contended that any dividends received by Light & Power on its holdings of Illinois Power common stock should be passed along to the former's stockholders when the exchange was made. The commission said that it considered the plan fair and equitable without distribution of the dividends. It pointed out, however, that the stockholders could appeal to the District Court if they desired. (Release No. 8763).

Texas Franchise Extended

Victoria, Tex., voters have approved a 30-year extension of the Central Power & Light Co franchise.

MEETINGS

Canadian Electrical Association—Winter Conference, Chateau Frontenac, Quebec, January 17-19.

Edison Electric Institute—Accident Prevention Committee, Book-Cadillac Hotel, Detroit, January 24-25; Transmission & Distribution Committee, Netherland Plaza Hotel, Cincinnati, February 10-11; Electrical Equipment Committee, New Jefferson Hotel, St. Louis, February 14-15; Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 5-7; Engineering Committees, Edgewater Beach Hotel, Chicago, May 2-4; Annual Meeting, Traymore Hotel, Atlantic City, May 31-June 2.

National Rural Electric Cooperative Association—Annual meeting, Hotel Commodore, New York, N. Y., January 31-February 3.

American Institute of Electrical Engineers—Winter General Meeting, Statler Hotel, New York, January 31-February 4; Conference on the Industrial Application of Electron Tubes, Statler Hotel, Buffalo, N. Y., April 11-12; South West District, Baker Hotel, Dallas, Tex., April 19-21.

National Association of Purchasing Agents—Public Utility Buyers Group, Mid-Winter Conference, Edgewater Beach Hotel, Chicago, Ill., February 7-8.

Missouri Valley Electric Association—Power Sales Conference, February 10-11; Sales & Rural Committee, February 25; Accounting Committee, March 7; Engineering Conference, April 6-8; Rural Roundtable, May 4, Sales & Rural Conference, May 5-6; Accounting Conference, May 12-13; Annual Meeting, May 17. All meetings at the Hotel President, Kansas City, Mo.

Pennsylvania Electric Association—Prime Movers Committee, Hotel Hershey, Hershey, February 10-11; Transmission & Distribution Committee, Benjamin Franklin Hotel, Philadelphia, February 24-25.

National Association of Home Builders—Convention and Exposition, Stevens Hotel, Chicago, February 20-24.

National Adequate Wiring Bureau—Annual Conference, Stevens Hotel, Chicago, February 24-25.

American Society for Testing Materials — Spring Meeting and Committee Week, Edgewater Beach Hotel, Chicago, February 28-March 4; Annual Meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 27-July 1.

Exposition of Electrical Progress—Municipal Auditorium, Kansas City, Mo., March 2-6.

Institute of Radio Engineers—National Convention and Exhibition, Hotel Commodore and Grand Central Palace, New York, March 7-10.

National Electrical Manufacturers Association—Winter Convention, Edgewater Beach Hotel, Chicago, March 13-18.

Conference for Protective Relay Engineers—Texas A & M College, College Station, Tex., March 14-16.

Oklahoma Utilities Association—Annual Convention, Hotel Tulsa, Tulsa, March 17-18.

Southeastern Electric Exchange — Engineering & Operation Section, General Oglethorpe Hotel, Savannah, Ga., March 24-25; Annual Conference, Boca Raton Club, Boca Raton, Fla., April 13-15.

International Lighting Exposition and Conference—Stevens Hotel, Chicago, March 29-April 1.

National Association of Corrosion Engineers—Annual Conference and Exhibition, Netherland Plaza Hotel, Cincinnati, April 11-14.

Midwest Power Conference—Sherman Hotel, Chicago, April 18-20.

National Electrical Wholesalers Association—Annual Convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 1-6.

American Society of Mechanical Engineers—Spring meeting, Hotel Mohican, New London, Conn., May 2-4.

Electrochemical Society—Spring meeting, Benjamin Franklin Hotel, Philadelphia, Pa., May 4-7.

Instrument Society of America—Spring meeting, Royal York Hotel, Toronto, Canada, May 12-13.

Boston Utilities Sign Pact for Power Interchange

An agreement providing for power interchange up to 40,000 kw has been reached by the Metropolitan Transit Authority, Boston, and Boston Edison Co.

The sale of power to either party by the other will be at the net cost of production at the time of delivery after certain specified adjustments. Substantial savings are anticipated by both from the reduced cost of fuel. MTA expects to effect net savings of about $150,000 per year.

The two utilities operate steam plants on neighboring sites in South Boston but require a 40,000-kw frequency changer and allied equipment for the projected tie-in. The Edison system operates at 60 and MTA at 25 cycles on its a-c side with the latter's distribution at about 600 v, d-c.

The changer is to be purchased by Boston Edison at an estimated cost of about $2 million. MTA's capital expenditure will not exceed some $3,000 for metering devices. No employee of the MTA power plants will be laid off as a result of the interchange pact.

Nothing in the agreement permits or suggests the possibility of the present or future acquisition of one party's power plants by the other, Henry Parkman, acting chairman of MTA, said.

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Icy Weather Threatens Breakdown of NW Pool

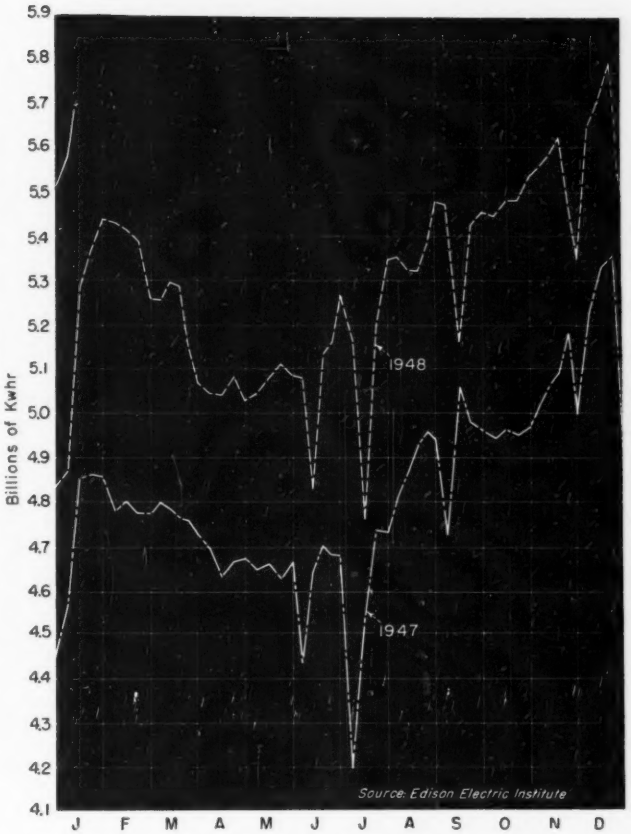
Marshall Blair, system supervisor for the Washington Water Power Co, expressed fear this week (Jan 10) that the current Northwest subzero snap might bring a breakdown of the Northwest Power Pool through ice conditions at some hydro plants.

The Black Eagle hydro plant of Montana Power Co on the Missouri near Great Falls, Mont., was reported out because of ice in intake streams, with loss of 18,000 kw, and the 20,000-kw Electron, Wash., hydro plant of Puget Sound Power & Light Co was out because of freezing of a 12-mile flume.

WWP on Jan 11 restored a 4,500-kw generator at Nine Mile Falls which had been damaged by fire resulting from overload.

The Northwest Pool is now feeding power to lines in Canada and Montana that formerly fed into it.

Blair stated that overloading in any area might cause automatic switches to open, isolating the affected area from the pool network. If automatic switches fail to function, other generators may burn up as in the Nine Mile plant.



Output Moves Upward, But Only 7.8%

With industries getting back into their stride after the holiday lull, the output curve swung sharply upward during the week ended Jan 8, 1949, according to figures released by the Edison Electric Institute.

The amount of electrical energy distributed by the light and power companies of the country totaled 5,691,770,000 kwhr, compared with 5,562,232,000 kwhr (revised) for the week ended Jan 1.

But the increase over the corresponding week of 1948, when a total of 5,277,680,000 kwhr was recorded, was only 7.8%. A percent increase of 14.3 was shown for the week ended Jan 1 as compared with the corresponding week of 1948.

For the first time since last September one of the geographical regions showed a decrease under the corresponding week of the previous year, the New England division reporting a drop of 1.6%.

Beginning with the week ended Jan 8, EEI has broken down the Southern States into separate units, Southeast and South Central, and in the future these separate units will replace what was formerly the Southern States.

Weekly Output, Millions Kwhr

1949		1948		1947	
Jan 8	5,692	Jan 10	5,278	Jan 11	4,853
Jan 1	5,562	Jan 3	4,868	Jan 4	4,574
1948		1947		1946	
Dec 25	5,508	Dec 27	4,830	Dec 28	4,442
Dec 18	5,790	Dec 20	5,368	Dec 21	4,940
Dec 11	5,705	Dec 13	5,327	Dec 14	4,778
Dec 4	5,646	Dec 6	5,218	Dec 7	4,673
Nov 27	5,349	Nov 29	4,983	Nov 30	4,448
Nov 20	5,627	Nov 22	5,180	Nov 23	4,765
Nov 13	5,571	Nov 15	5,084	Nov 16	4,670
Nov 6	5,564	Nov 8	5,057	Nov 9	4,682
Oct 30	5,555	Nov 1	5,009	Nov 2	4,628
Oct 23	5,539	Oct 25	4,964	Oct 26	4,602

Percent Change from Previous Year

	Jan 8	Jan 1	Dec 25
New England	− 1.6	+ 9.6	+11.0
Mid-Atlantic	+ 5.7	+11.9	+ 9.2
Central Industrial	+ 8.9	+12.6	+14.1
West Central	+12.4	+16.0	+15.5
Southeast	+ 0.4	(+16.7)	+13.1
South Central	+14.9	( )	( )
Rocky Mountain	+19.1	28.7	+20.2
Pacific Coast	+13.9	15.3	+20.6
Total United States	+ 7.8	+14.3	+14.1

WASHINGTON COMMENT

WILLIAM B. WHICHARD

DON'T LOOK NOW, but the Atomic Energy Commission Industrial Advisory Committee's report is still showing. And for all its lack of proper publicity and intelligent discussion, it's still a good report.

Big mystery is why the AEC went to such lengths to play down the document. For five days, the Commission sat on the report. Then, on the eve of the year's biggest holiday, it decided to turn over the report to the press. Meanwhile, it had rushed through two other press releases, both of which had been cooking for several weeks. These releases announced new AEC contracts with DuPont and Westinghouse, both having dramatic implications.

And AEC didn't stop there. It scheduled a press conference for the announced purpose of clarifying issues raised by the report. Chairman Lilienthal of AEC and Detroit Edison Co's President James W. Parker, chairman of the industry group which spent a year combing through AEC policies and operations, were both present.

To put it mildly, the press conference failed to live up to the advance billing. As they entered the session, newsmen were handed a five-page AEC reply to the report. This indicated that the Commission already was doing a number of things which, superficially at least, seemed in line with the report's suggestions. The conference itself quickly got on another tack when Lilienthal let slip that plutonium production at Hanford might have stopped in 1946 if AEC had not rebuilt the plant.

That gave the newspapers four stories on matters atomic for between-holidays editions. Most papers devoted the headlines to the Hanford "near-disaster." Mention of the industry committee report was well buried and brief.

The key recommendation of the report—a plea for a new approach to the problem of getting more industries into atomic development—still stands, of course. AEC has given no sign that it will take any serious steps in the direction pointed out by the Parker group. But, in perhaps his only pertinent remark at the press confab, Lilienthal said he saw no "insurmountable" barrier to recommended methods for baring more information to industry.

Basic premise of the report was that AEC's work would go faster and farther if the Commission, consistent with security, would open the doors to industry to tackle industrial applications on a competitive basis. Industry cooperation, the Parker group asserted, has been largely thwarted by AEC's present policy of assigning specified problems to individual contractors on a "hired hand" relationship to the government.

AEC's industry advisory group scouted the theory that private enterprise demanded a quick cash return for its efforts in behalf of atomic development. Hope for financial reward in the "distant future," desire for "prestige," the will to get an early start in an "important new field," and patriotic concern for national defense would be sufficient inducement, it was argued.

Industry interest has lagged, the committee held, because industry knows not how nor where it can take part in the atomic program. Under its contract system, AEC picks a field, selects a problem therein, then seeks industry aid in that one small area.

With more information—about how AEC makes contracts, about what its problems are, about the scientific and engineering progress already made—industry could and would take more interest, the Parker group concluded.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Reliability and availability should be susceptible to more concise definitions than those now accepted for either attribute.

Condensing water sufficiency is steadily becoming a more important factor in choice of plant sites.

Plant component costs for London's new Kingston Station, one of 25 in the Grid's 1948-52 program were: mechanical plant, £30.6 per kw; electrical, £4.6; total, £48.7. Initial capacity two 30 Mw, ultimate four.

Power and water are both conducted in galvanized pipe in Tucson. The city manager became aware of the indistinguishability of the two when a water department man sawed into a 4-kv cable—fortunately with impunity.

Power plant sidings of asbestos in one instance cost less than 1/6 as much as brick laid with a 400-per-day limitation.

A universal watthour meter (in single-phase and polyphase forms) is being agitated. The upscale range is much less a problem than the light-load performance.

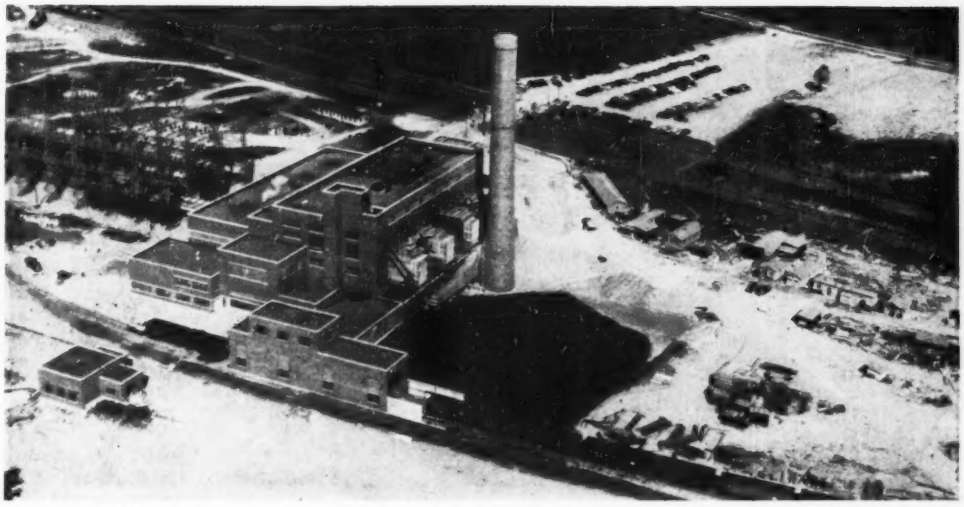
More 220-kv tie-lines would become tapped for feeders if the reliability could be sustained and if the requisite circuit breakers were not so prohibitively costly.

Radar waves of 1.25-cm length have promise as a means of detecting the approach of storms.

Distribution and local transformer peaks can result at other hours if water heaters are cut off during the mid-forenoon and early evening to avoid generation peaks.

Poles can be loaded at the yard by the truck driver and a single helper when aided by an I-beam trolley and an electric hoist.

Fluorescent lamps gain 15 to 20% in efficiency when the conventional gases are replaced by krypton.



WARREN STATION on the Allegheny River in northwestern Pennsylvania, is chief generating point in the company's northern division

Operating Efficiency, Convenience Key to Warren Station Design

Built during period of high construction cost, station design seeks operating economy through features that increase efficiency of men and machines; reduce operating force required to minimum

W. C. SONTUM
Vice-President, Pennsylvania Electric Co
Johnstown, Pa.
and
R. H. KREISINGER
Sponsor Engineer, Gilbert Associates, Inc
Reading, Pa.

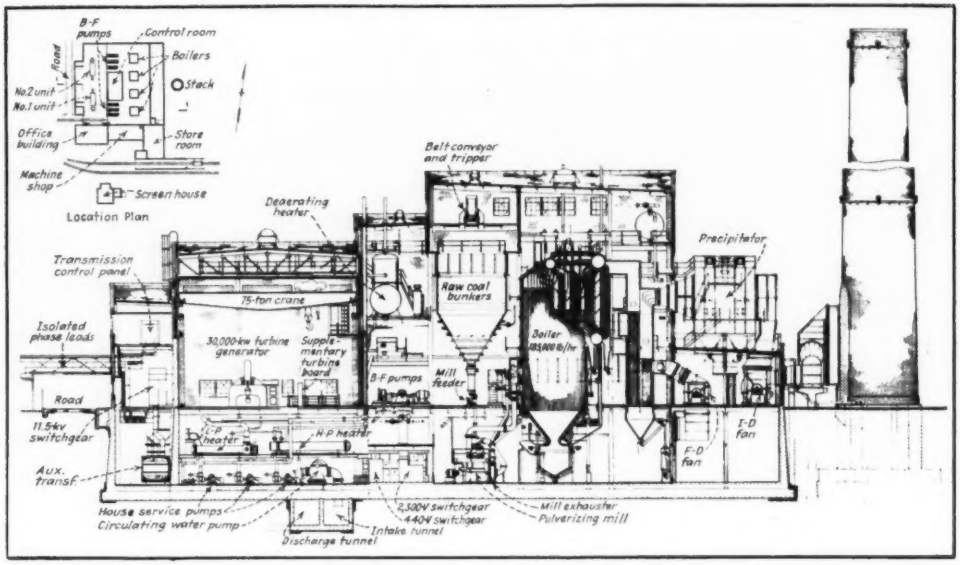
CONCEIVED during the late war years as the generating bulwark of Pennsylvania Electric Co's burgeoning northern division in the Allegheny River Valley, Warren Station was built during the postwar period of rapidly rising costs. Consequently it represents an investment that is perhaps 50% higher than it would have been in 1939.

Its design, therefore, has been directed at offsetting this comparatively high first cost through the reduction of operating cost. Operating convenience and efficiency and minimum attendance have been particular design goals. Warren's initial 30,000-kw installation has an operating force of only five per shift. There will be a minimum increase when the second 30,000 kw is added this spring.

Automatic equipment and controls are natural prerequisites for minimum attendance and efficient operation, and are to be found in quantity at Warren. Other features are perhaps equally responsible for the station's operating convenience. Particularly significant among these are the low compact building arrangement that makes for easy surveillance of station apparatus, and the unique glass-enclosed, air conditioned, centrally-located control room from which one man regulates boiler, turbine and pump operations.

The station boasts other significant features, several of which are, to the authors' knowledge, "firsts" in the steam generating station field:

1. All-electronic, individually-excited turbo-generators with individual exciter alternators.
2. All-electronic generator voltage regulator and load compensator.
3. A common air supply system for the station's pneumatically-operated high voltage circuit breakers.
4. Electronic, totally-immersed high voltage rectification for the electronic precipitators installed on all boilers.
5. Installation of a 2-pass condens-



LOW AND SPACIOUS, the station building has the bulk of major equipment and auxiliaries located on operating floor at ground level. Ample room around machines makes maintenance faster and more convenient for plant personnel

er, tubed at the factory and trucked in sections to the plant where it was welded in place.

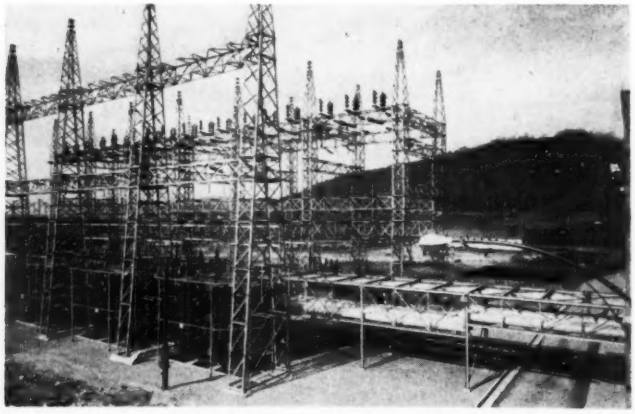
6. Extensive use of isolated phase construction for 11.5-kv leads throughout the station.

The initial concept for Warren was a 3-unit plant with the first unit a 30,000-kw machine. The second unit was to be installed five or six years later. But actually the second unit was authorized in 1946 when the building excavations for the first unit barely were completed.

Policies of Penelec and Gilbert Associates, their consulting engineers, required installation of two boilers for the first unit of any isolated power station for reliability reasons. It is thus possible at Warren to develop 60% of turbine nameplate capacity with one boiler while maintaining the conservative furnace heat release rate of 18,850 Btu per cu ft per hr.

The second unit was to have been a one-boiler, one-turbine team. However it followed so closely on the heels of the first that duplication throughout was no more expensive than the one-boiler one-turbine combination. Actually, the duplication of building steel, boilers and auxiliaries sped deliveries and cut the engineering cost and the required time to get the second unit going.

The arrangement had several advantages not at first apparent. The four identical boilers permit nameplate rating to be carried on the two turbo-generators with only three boilers. The two units, both boilers and turbines, will be interconnected on both the main steam header and the boiler feedwater header after the last extraction heaters. Thus steam



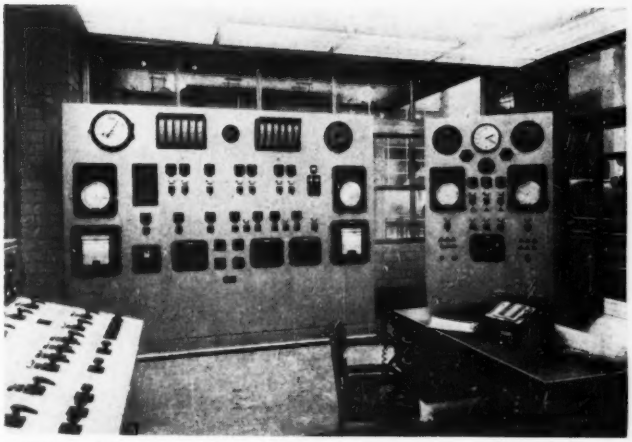
ISOLATED PHASE CONSTRUCTION is used to carry 11.5-kv generator leads from station building to the three main 25,000-kva, 3-phase, 3-winding transformers

Vital Statistics
Warren Steam Generating Station

Turbine Nameplate—Capacity	30,000 Kw
Maximum Load Carried	43,000 Kw
Throttle Pressure & Temperature	850 psi 900 F
Capacity Each Boiler	185,000 lb per Hr
Full Load Water Rate	9.22 lb per Kwh
Heat Rate Turbine 100% R.E.	9,537 Btu per Kwh
Heat Rate Station—Net	12,000 Btu per Kwh
Number Stages Bled	4
Estimated Cost (Max. Load Basis)	$150 per Kw

from each turbine can go through its respective stage heaters, mix and pass to a common boiler feedwater header serving all boilers. Optimum operation prevails when turbo-generators share load equally. With unbalance, however, tendency of condensate to accumulate in one section and drop in the other can be corrected by adjusting transfer pumps.

This cycle, illustrated in the heat balance diagram, includes floating deaeration and a customary arrangement of stage heaters. Heat balance and design was worked out for 875 F at the throttle, although boilers, superheaters and turbines are selected for 900 F operation. This is not a deliberate sacrifice of 25 F but represents anticipated erratic results in the control of superheated steam temperature. If smooth superheated steam temperature is maintained, operation at 900 F is advantageous.



CENTRAL CONTROL ROOM between boiler and turbine room is equipped with meters and controls for turbine, boilers and principle auxiliaries associated with the unit. Only one man is stationed in the control room, which is brightly lighted and air-conditioned

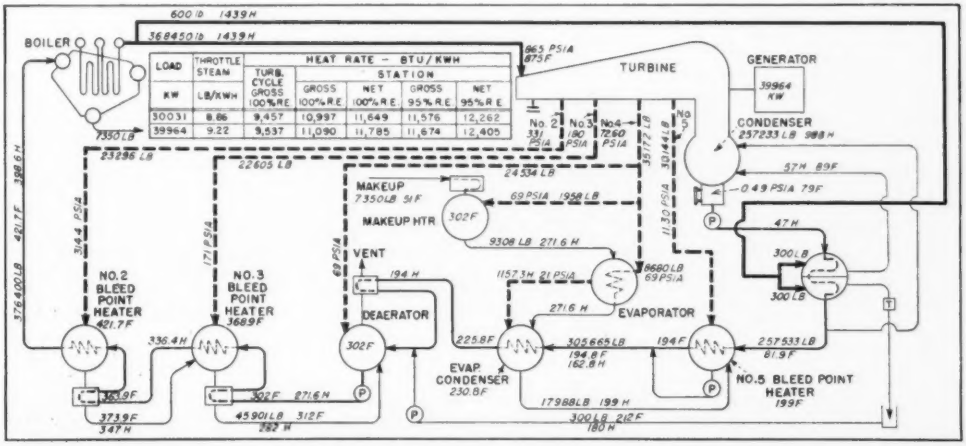
Control Room Centralized

Ability to get over 40,000 kw from a 30,000-kw nameplate capacity machine is effected at Warren by using hydrogen coolers for the generators, and ample sizing of such auxiliaries as forced and induced draft fans and boiler feed pumps. Station cost of $150 per kw of maximum load carrying capacity does not appear to be excessive at this date.

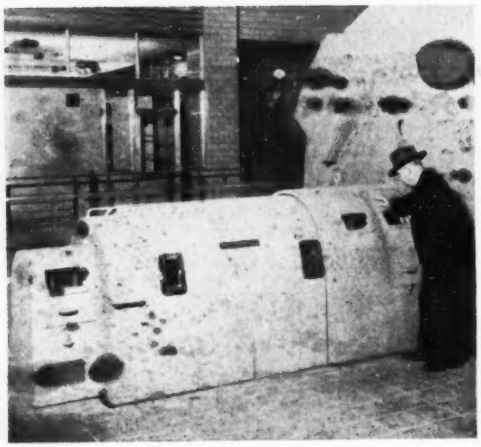
One of the keys to the efficient use of operating manpower at this station was the arrangement of the control room, heart of station operations. Completely glass enclosed, air conditioned and brightly lighted, it is located in the aisle between the boiler and turbine rooms with a commanding view of the main boiler room operating aisle and the turbine room.

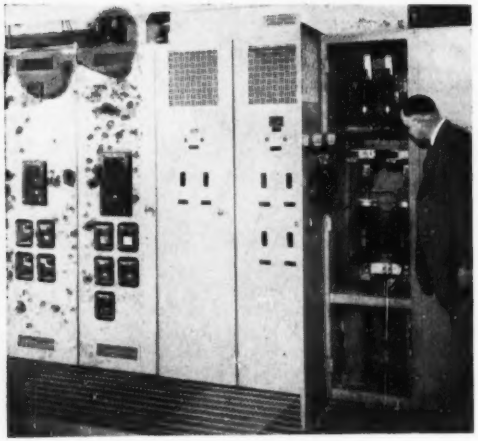
One man, the central control operator, works in the center of a hollow square surrounded by the control boards for the turbine, boilers, pumps and principal auxiliaries. When the second unit is placed in service a second central control operator will work from the center of a similar square of controls for the second unit —more or less completely separated from the operations of the first unit.

The reason for giving control of turbine loading to the central control operator is that he can exercise his discretion in distributing the load among boilers. This operator knows the rate of steaming of each boiler and the load on the turbine unit for which he is responsible. He is at liberty to change load on the turbine unit for which he is responsible. He is at liberty to change load on the turbine to suit steam production of



HEAT BALANCE diagram for first 30,000-kw unit. When second unit is added both boilers and turbines will be interconnected on main steam and boiler feedwater headers after last extraction heater. Steam from each machine will go through own heaters





ELECTRONIC EXCITATION SYSTEM that supplies the main generator field consists of a 6-phase alternator connected to the turbo-generator shaft (left). Alternator output is rectified by three pairs of Ignitron tubes (right). A separate electronic regulator governs the generator field current by controlling the firing of the Ignitron output tubes. System is first of its type

boilers under his direct supervision.

The five station operating personnel associated with the first unit include: Watch engineer; central control operator; assistant fireman; turbine operator; and condenser operator. When the second unit goes into operation a second central control operator and additional personnel as required will be added to the staff. Thus, more than 80,000 kw will be produced with a minimum of shift operating personnel.

Building Arrangement

Also contributing to operating convenience is the general station arrangement. The buildings could be low since ample land was available and it was not necessary to mount auxiliaries high above ground to save space. Forced draft and induced draft fans, boiler feed pumps and pulverizer mill feeders are all on the operating floor at ground level. This contributes to convenience in routine tasks and assists in observing equipment during emergencies. Ample space around machines and auxiliaries inside the plant is another factor contributing to the convenience of operation and maintenance.

The possibility that the area adjoining the plant might become residential led to installation of electrostatic precipitators on all boilers. These are located outside the plant above the fan room, near the stack.

A substantial saving in building volume was made possible by the electronic rectification of the a-c supply, using Kenotron tubes, to furnish the necessary d-c high voltage for precipitator operation. The electronic rectification equipment is mounted in oil-filled transformer cases, thus permitting completely outdoor installation. This was not possible with mechanical rectification.

The unloading of hopper cars of frozen coal was given considerable attention. Thawing pits are provided where oil, atomized by compressed air, is burned under the cars which are then drawn into the track hopper house. Here remaining frozen lumps are broken and freed with a 6,000-lb "guillotine" blade, the width of the car. This is dropped repeatedly to free "balky" coal.

Electronic Excitation

On the comparatively long period runs of modern a-c generators, commutators on main and pilot exciters have been the cause of trouble resulting in generator outages, due to their nature and service requirements. For this reason an effort was made at Warren to substitute electronic rectification in place of all rotating commutators.

Use of this new form of rectification in generator excitation is one of the station's outstanding features. In design and method of application it is the first of its type, as each of the two generators is supplied by an entirely separate excitation system consisting of a 6-phase alternator, 380-v line-to-neutral, directly-connected to the main turbine shaft. This 6-phase alternator feeds three pairs of Ignitron tubes which are the main supply for the excitation of the main generator. Regulation of the main generator field current is achieved by a separate electronic regulator controlling the firing of the output tubes.

The six rectifier tubes with their separate firing control are grouped in pairs and represent an excess of capacity to allow for maintenance and servicing. According to the requirements, four of these output tubes are ample for complete turbine-alternator overload operation. Furthermore, it is possible to continue service at unity power factor with full load from the output of only two tubes. High-speed automatic anode breakers serve also as the main generator field breaker.

A separate group of vacuum tubes is used to rectify the supply for the exciter alternator field. Regulation of this supply is accomplished by a standard BJ-30 regulator. Simplicity from a control and maintenance standpoint, ease of operation and reliability due to inherent reserve capacity have proved to be desirable.

All indoor and outdoor high-voltage circuit breakers at Warren of

11.5, 33 and 110 kv are pneumatically operated. For what is believed to be the first time in central station history, a common compressed air supply system is used in preference to individual air compressors for each breaker. In all there are 29 circuit breakers in the three voltage ratings.

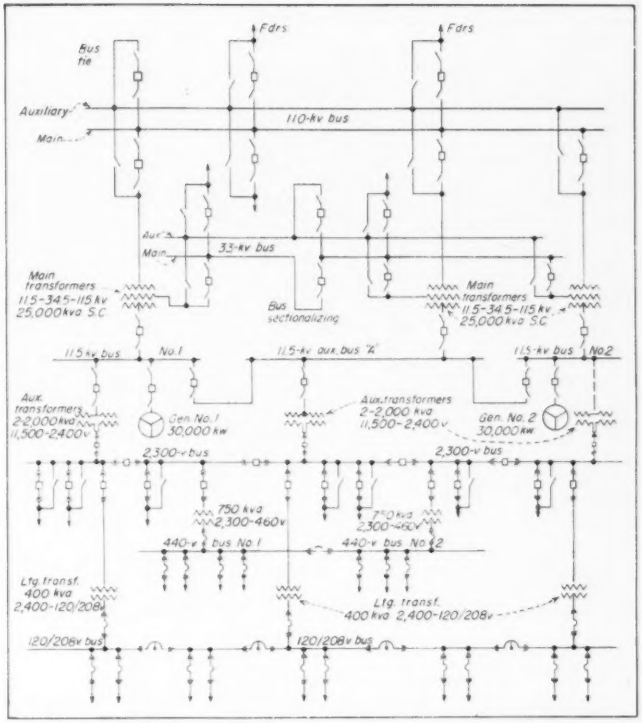
Common Air Supply

Elimination of the large number of individual air compressors was economically desirable and it was felt that a common air system would be practicable. Accordingly two large air compressors, each rated 41 cfm at 250 psi, were installed in the basement of the plant. A compressed air header was run from one air compressor to supply all the indoor breakers and looped back to the other air compressor with a tie between the individual discharges at the air compressors. Two connections leading from this loop were carried throughout the substation. These two air lines are insulated and carried underground. A pair of tempering tanks is located near the first 110-kv air breaker.

While the compressed air is comparatively free from moisture, methyl alcohol is installed in both the tempering and the drain tanks that accumulate any moisture that may be condensed from the compressed air. The alcohol picked up by the compressed air also makes any moisture "freeze proof" throughout the air system. Moreover, its odor makes leak detection easier.

Phase-isolation construction is used for all 11.5-kv generator and transformer leads to follow out the scheme of building reliability into this station. Generated power is carried in isolated phase leads from the generator terminals along and below the operating floor to the 11.5-kv switchgear at the west side of the building. From the switchgear, isolated phase leads are carried to the station auxiliary transformers on the basement floor. Other similar leads run from the 11.5-kv switchgear through the building wall to the substation yard and connect to the main transformer banks, a distance of 200 ft.

The three, 3-winding transformers in the substation yard step generated voltage up from 11.5 kv to 33 and 110 kv. These transformers have a



ELECTRICAL DIAGRAM *reveals the relative simplicity of stations electrical system. Note provision of by-pass switches on 2,300-v breakers to avoid interruption of auxiliary power supply during breaker outage. All auxiliary supply transformers are air cooled; all auxiliary supply feeders have air circuit breakers. Auxiliary transformer banks have 4,000-kva rating*

self-cooled rating of 25,000 kva and a forced-cooled rating of 41,000 kva. It is therefore possible to handle the total station output on the forced-cooled rating of the transformers upon the loss or outage of one of the three transformer units.

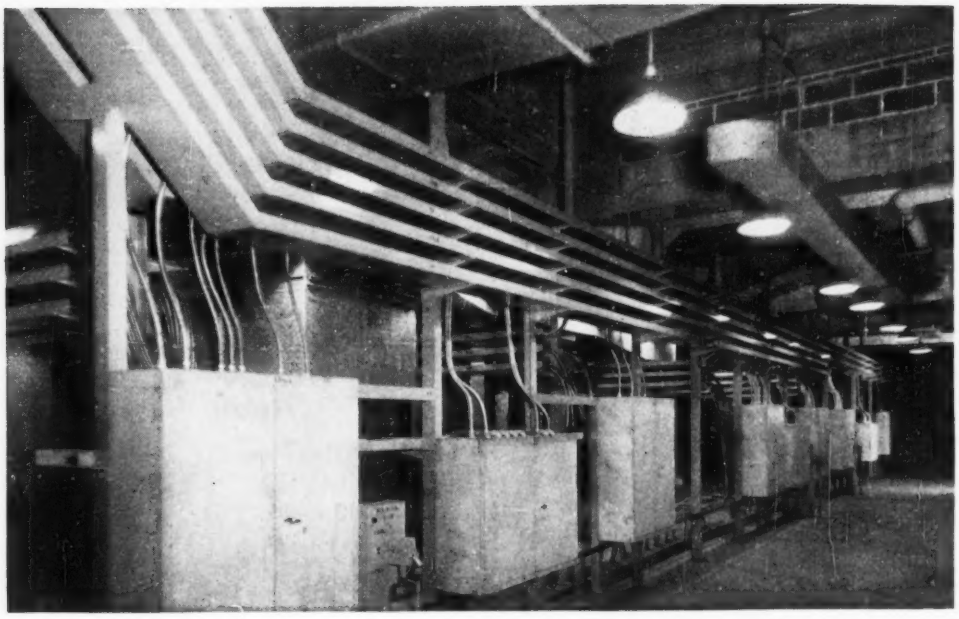
Connected to the 11.5-kv buses are the three 4,000-kva transformer banks that transform power to 2,300 v for station use. Each of these three banks consist of two 2,000-kva air-cooled 3-phase transformers connected in parallel, which therefore constitute the equivalent of one 4,000-kva transformer. The use of split units provides flexibility since, in the case of trouble, the affected section of station service can be operated at half capacity with the one remaining unit.

Two 750-kva transformers step power down from 2,300-v to 440-v for minor plant auxiliary use. Three other 400-kva transformers step down to 120/208 v for smaller station auxiliaries and lighting.

The whole of the station auxiliary switchgear is located in rooms in the basement between the boiler and turbine room and their basement auxiliaries.

Main station auxiliaries, driven by the larger motors, are connected directly to the 2,300-v bus through solenoid-operated air circuit breakers. A circuit-breaker by-pass disconnect switch is provided on each breaker to keep the feeder in service on the boiler or turbine auxiliaries in emergencies. Interlocks make it impossible to operate the disconnect switch unless the breaker is closed.

The system control room for Penelec's northern division is located on the floor above the operating floor and overlooks the outdoor substation. It contains only controls for the substation and supervisory control for other remote substations.



HORIZONTAL RUNS in one of the stations illustrates the adaptability and flexibility of metal troughs used for training armored cable

Supporting Cables in Power Station Simplified

Use of standard basic elements for training and supporting cable provides extreme flexibility at low cost . . . Horizontal runs are routed in troughs; vertical runs in riser housings

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DEVELOPMENT of a number of uniform basic elements has greatly simplified the problem of training and supporting control and auxiliary power cables in power stations. These elements may be procured in quantity in advance of layout plans, thus eliminating the problem of delivery and affording more time for the study and development of a final arrangement. Because of the uniform elements, greater flexibility is afforded in the arrangement both before and after installation. The entire system is installed in the field from assembly drawings thus almost entirely eliminating shop detailing.

Basic elements used are: (a) Sheet steel troughs approximately 12 in. wide, 2½ in. high and 10 ft long, of 11 gauge material; (b) cross arms for supporting these troughs and attaching them to the primary supports. Fig 4; and (c) supports for vertical cables, Fig 2.

Cables are routed horizontally in the troughs, which are supported from below or suspended from above by means of structural steel members of the proper size and shape. Troughs may be arranged either singly or in tiers and are supported at 5-ft intervals. They are cut to fit and welded. Typical arrangements are shown in Fig 1.

Cables are routed vertically in the basic supports (Fig 2) which are located at 6 to 8-ft intervals and anchored to walls or structural supports. Stamped steel cable clamps are attached to the webs of these ele-

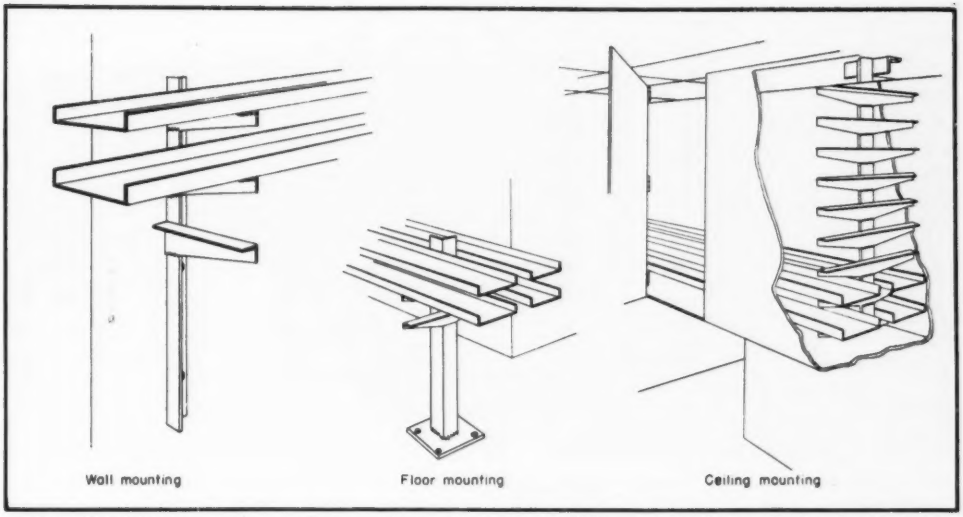


FIG 1—TROUGHS supported by wall, floor or ceiling mountings can be installed from assembly drawings. Shop detailing is minimized

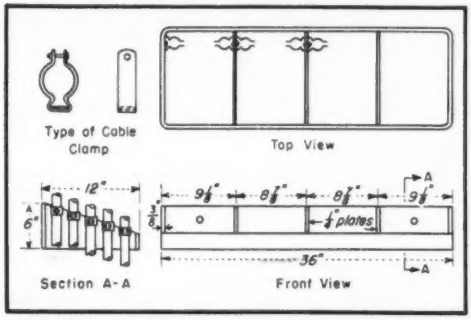


FIG 2—TECHNIQUE of supporting vertical cables in riser housings. Cable clamps allow tightening after cables are in place

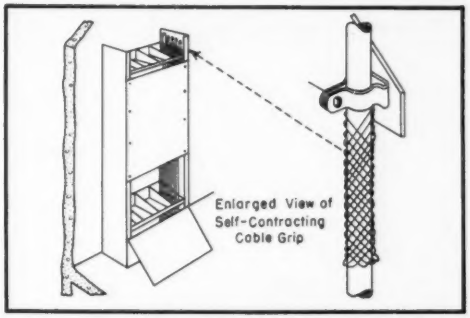


FIG 3—CABLE GRIPS are used to provide the additional support required by long, vertical, lead-sheathed cable runs

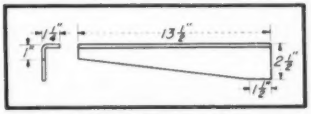


FIG 4—CROSS ARMS that support troughs are formed from 3/16 in. steel plate

ments and are sufficiently offset to afford unobstructed access for tightening after the cables are in place. Long, vertical, lead-sheathed cables require additional supports which may be self contracting cable grips anchored beneath the clamps (Fig 3).

To improve the appearance or add further protection, cables may be completely enclosed in horizontal troughs by attaching sheet steel covers to trough sides. Hinged access sections are provided at strategic points for cable pulling. To cover vertical cable groups, bent plate angles, with one leg extending from the wall to the front of the support and another running parallel to the wall in front of the support, are attached to the sides of trough support. Flat steel sheet covers are joined to these angles. Hinged sections are provided at each cable support for access to cable clamps (Fig 3).

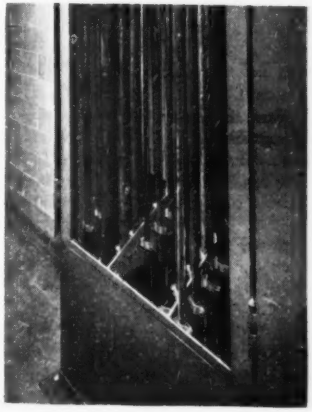
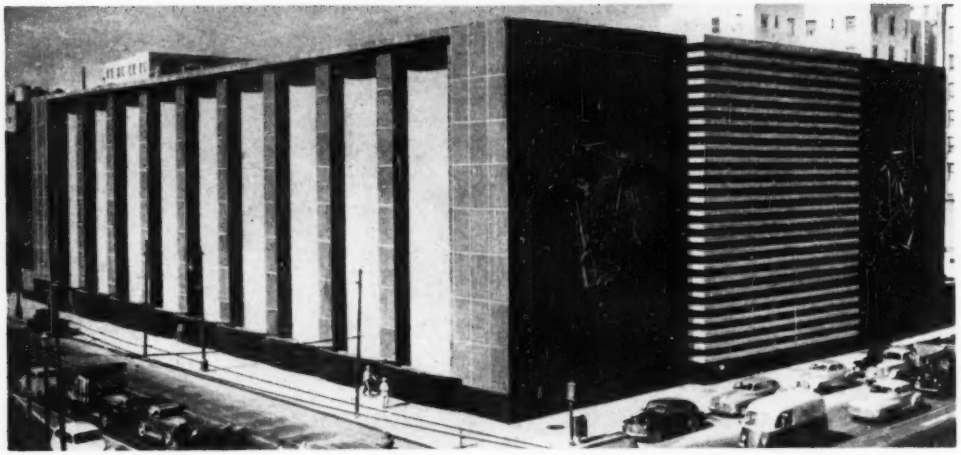


FIG 5—SUPPORTS for lead cable installed in vertical shafts are readily accessible through hinged steel covers



STRIKING MODERN EXTERIOR of Pacific Gas and Electric Co's new Mission substation in San Francisco is matched by careful engineering design throughout. Reliability, equipment arrangement and soundproofing were major problems encountered

New Substation Solves Many Problems

Ring bus arrangement of 110-kv service was adopted as compromise between factors of space, location and operational flexibility

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Engineering Dept
Pacific Gas and Electric Co
San Francisco

DESIGN and location of the substantial facilities required to supply power to a congested downtown area posed many technical problems. The new Mission substation built by Pacific Gas and Electric Co to serve downtown San Francisco incorporates solutions for a wide variety of such problems. Location, appearance, reliability, ratings and arrangement of equipment, possible fire hazards and soundproofing are among the most important.

From the standpoint of size alone, the problem of locating a station designed for ultimate capacity of 170,000 kva in a congested area is not easy. In addition, close proximity to San Francisco's large and well-planned Civic Center made mandatory careful architectural treatment. As a result of careful planning and engineering design, the $4,800,000 installation will be an asset not only in serving the area more economically, but in appearance as well.

Mission substation will serve as a source of additional energy to increase capacity and relieve overload conditions in the downtown area. Within the building are two 35,000-kva, 110—12-kv, 3-phase transformers; a 110-kv transmission ring bus with four 110-kv oil circuit breakers; one section of 12-kv subtransmission* bus; and three sections of 12-kv distribution bus. Ultimately there will be two 35,000 and two 50,000-kva transformers; seven 110-kv oil circuit breakers in the ring bus; two sections of 12-kv subtransmission bus; and six sections of 12-kv distribution bus.

Five 12-kv subtransmission circuits supplying other stations have a capacity of 85,000 kva. Three more subtransmission circuits constitute a 51,000-kva tie to a generating station. Underground networks and radial feeders will be supplied by 13 distribution feeder circuits at 12 kv.

Early studies showed that this additional energy could not be economically furnished from major points of supply through increased facilities at 12 kv. Location near the downtown area made underground cable the only possible method for supplying the station. Economic studies of 23, 60 and 110-kv transmission showed 110 kv to be most economical for the block of power required. Gas-filled, pipe-type cables from two sources were therefore selected to provide the necessary means of supply (ELECTRICAL WORLD, Aug. 28, 1948, page 77).

Departure from the standard 110-kv double bus arrangement used by PG&E was made to hold costs at a justifiable level. Flexibility of a double bus is well recognized, and it is first choice when an outdoor station is considered. Location and space factors, however, dictated indoor construction in this case. A

* "Subtransmission" as used in AIEE report on *Electric Power Distribution Systems, Electrical Engineering*, November, 1948.

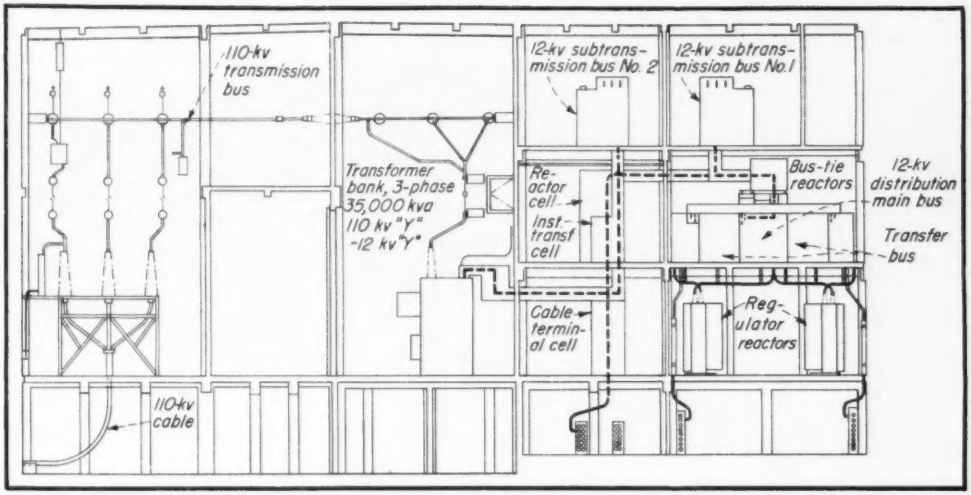

FIG 1—CROSS-SECTION of building shows compactness of low-voltage equipment. Feed from subtransmission bus drops vertically to reactor and cable terminal cells on floors below. Distribution circuits are fed in the same way to regulator reactors

double bus indoors could not be considered because of the large building required and associated high cost of structure and land. A ring bus was therefore adopted as a compromise. Its flexibility is slightly less than a double bus, but in this instance the cost is substantially less.

In the physical arrangement of the ring bus, greatest reliability of service with only two cables installed was obtained by alternating cable and transformer locations as shown in Fig 2. This was not the least expensive arrangement because it required considerably longer secondary leads of segregated bus from two of the transformers. However, with the simplest arrangement (all cables in adjacent locations) there is danger of losing both cables, and therefore the station, upon failure of the bus circuit breaker between cables.

For even greater reliability, all equipment in the 110-kv section is outdoor type. Phase and ground clearances, in general, comply with outdoor construction standards.

A segregated metal-enclosed bus assembly interconnects the 12-kv side of the 35,000-kva main transformers and the low voltage switchgear. The 12-kv switchgear is in two sections, a subtransmission section and a distribution section.

Arrangement of the 12-kv, 2,000-amp subtransmission double bus and

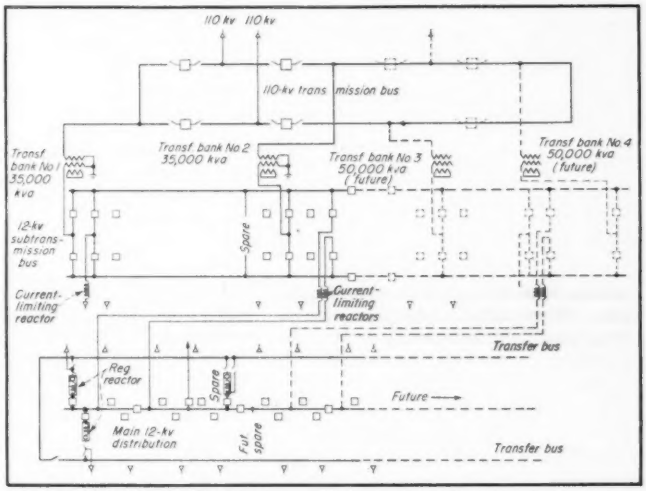

FIG 2—SINGLE-LINE DIAGRAM shows 110-kv ring bus with provision for future transformers, oil circuit breakers. Reactors have been installed to limit interrupting duty on subtransmission tie circuits and also on distribution bus air circuit breaker

1,000,000-kva interrupting capacity air blast switchgear is shown in Fig 1. This arrangement provides short bus runs, general compactness and high accessibility within the limited space available. To reduce short-circuit duty on older equipment in connected stations, the eight tie-line circuits have current limiting reactors rated 900 amp, 5%. All parts of this 12-kv subtransmission bus and switchgear have an impulse level of 110 kv.

The 12-kv distribution switchgear consists of a main bus in three sections and a transfer bus in two sections. Interrupting duty for the solenoid-operated air breakers is limited to 500,000 kva by current limiting reactors rated 2,000 amp, 8%. Location of these reactors on a structure above the distribution bus

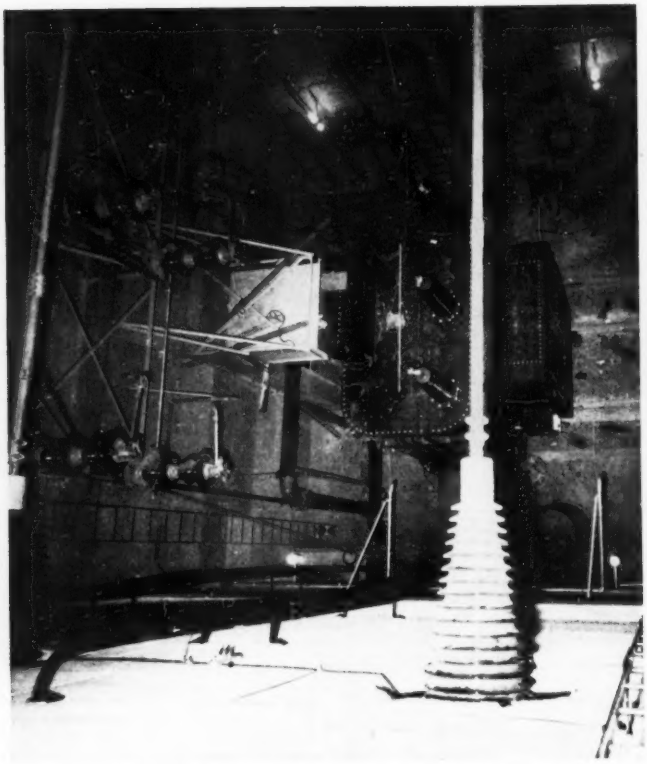

FIG 3—TWO PHASES of 110-kv ring bus are shown in this view of one of the 35,000-kva transformers in its soundproofed vault. For greater reliability all 110-kv equipment is outdoor type, with all clearances designed to comply with outdoor standards

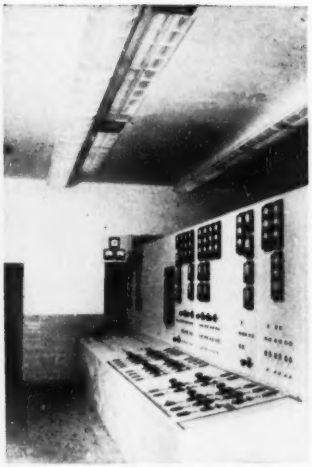

FIG 4—CONTROL ROOM lighting is designed for equal illumination on vertical and horizontal surfaces. Recessed fluorescent fixtures with asymmetric lens bring vertical surfaces up to same level as general illumination provided by surface-mounted units

cubicles solved a critical space problem. Three-phase, step-type regulators, rated 7½% raise and lower on all distribution feeders, are located directly beneath the distribution switchgear room.

Fire Hazard

Extensive use of air circuit breakers in distribution and substation tie feeders (total of 39 breakers) was the result of efforts to reduce to an absolute minimum the fire hazard associated with oil-filled equipment. Oil-filled equipment in the 12-kv section consists only of the regulators and a cable testing transformer in the basement. Oil-filled equipment—main transformers, 110-kv oil circuit breakers and 12-kv regulators—is located in fireproofed rooms. Fixed water fog equipment, automatically operated, has also been installed.

A principle of control room lighting new to the PG&E has been applied to provide more effective switchboard illumination in the control room. In the past, desired level of illumination on vertical switchboard areas has been achieved chiefly through design of general lighting of the room and fixture location. This obviously raises illumination of horizontal surfaces substantially beyond that required or desirable. General illumination for the control room is furnished by surface-mounted fluorescent fixtures giving the desired intensity on horizontal surfaces. Recessed fluorescent fixtures with asymetric characteristics raise the illumination of the vertical instrument boards to approximately the level of the horizontal surfaces.

Lighting in other areas is conventional, with fixture-lowering devices used for highbay incandescent fixtures. Lighting of the striking modern exterior of the building is accomplished with extensive installations of fluorescent cove units and incandescent floods requiring some 300-kva capacity.

One of the most critical factors concerning those in the vicinity of the building was soundproofing. Main transformer rooms, walls and ceilings were soundproofed with material 4 in. thick, following recommendations of an outside organization which specializes in methods of soundproofing. This material is expected to absorb 50% of the sound energy from the transformers. Transformer foundations were built as structures independent of the building to prevent vibration (transformer hum) from being picked up and transmitted to the outside. There are no windows in the building, eliminating another noise escape path.

Ventilation

Ventilating air for the 12-kv section of the building is treated with a precipitating-type air filter. This keeps dust accumulation and, therefore, cleaning and maintenance on insulators and the many air circuit breakers to a minimum. An independent ventilating system on the 110-kv side removes main transformer heat losses.

Network Limiters Aid Service Continuity

Current limiters on Portland, Ore., network maintain service continuity on all but faulted sections . . . As substitute for conventional junction box they take about half the space in transformer vaults

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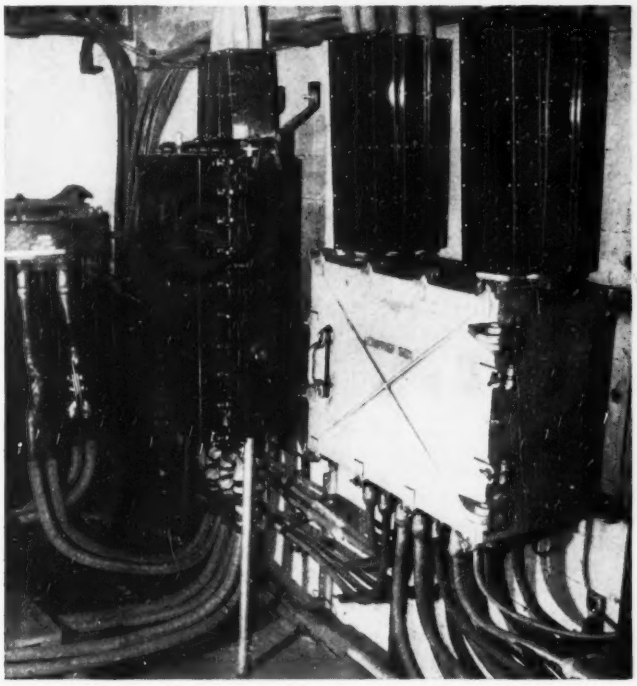
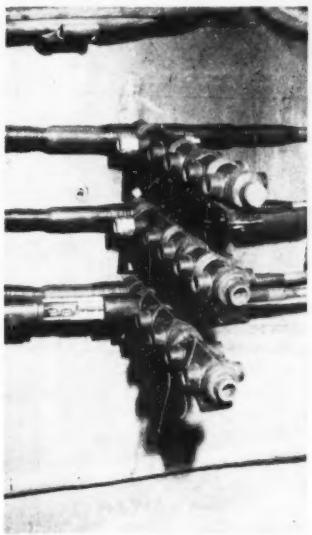
Asst. Supt. of Underground
Portland General Electric
Portland, Ore.

PERFECT service continuity in all but faulted sections of the downtown network is the ultimate purpose of current limiters being installed by Portland General Electric Co. The limiters also substitute for the conventional junction box, with its wiped joints, a much smaller watertight assembly with pressed connectors. As a result, installed cost of the limiters is about 60% less than conventional construction using junction boxes.



CONVENTIONAL JUNCTION BOX installation requires about twice the space of new limiter installations. Box provides for two 1,500,000-cir mils secondary feeds, but only six outgoing circuits up to 1,000,000 cir mils

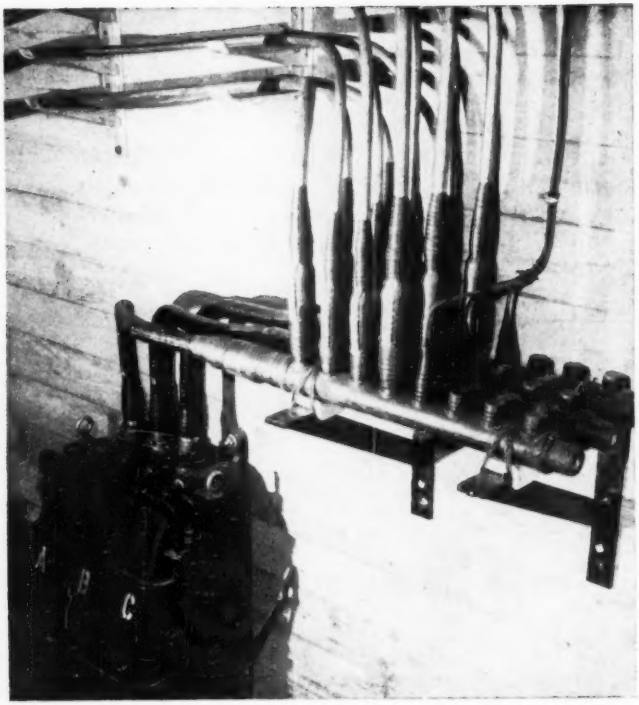


LIMITER at street intersection provides 13 positions for cables up to 500,000 cir mils. Fusible link on lower left is covered by asbestos shell, rubber sleeve and rubber and weather-resistant splicing tapes to render the joint waterproof and submersible

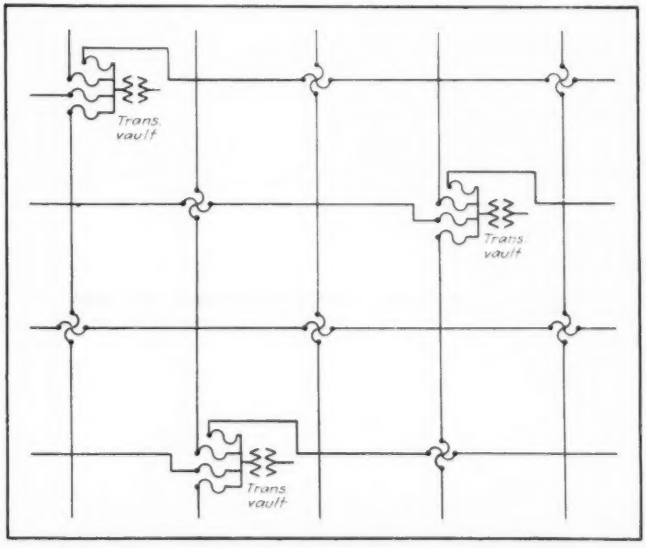
Downtown Portland is served by an underground 120/208-v network covering about 280 city blocks. Much of the network consists of 3-conductor 500,000 cir mils cable laid in 2½-in. square duct, an outgrowth of Portland's early 3-wire d-c system. The present installation provides only for isolating faults on the primary side of the six 4,150-v circuits feeding the network. Anticipated difficulty of burning clear a serious fault on the secondary 3-conductor cable has caused concern even though no serious fault has occurred to date.

The first phase of the program for protecting the secondary network provides limiters at alternate street intersections. This divides the network into 4-block sections as shown in the diagram on page 90. The four limiters feeding a fault will open and isolate only that 4-block section.

The next phase of the program, planned for completion in 1950, is to install limiters at practically all of the remaining intersections. This will provide isolation of any single block



CURRENT LIMITERS protect secondary network of Portland General Electric Co in downtown Portland, Oregon. Limiters provide for a 1,500,000-cir mils transformer secondary feed at each end consisting of eight outgoing circuits up to 500,000 cir mils. Eight more circuits are available by adding another limiter in series in each phase



AT ALTERNATE INTERSECTIONS of the network, limiters isolate any 4-block section in which a fault occurs. By 1950 limiters will be installed to isolate single-block sections

on the system experiencing a fault.

Installation of the limiters required about one-half the space required by the less flexible conventional junction box in transformer vaults. This is clearly shown in the accompanying photographs of comparable installations. Both have provision for two 1,500,000-cir mils transformer secondary feeds. The conventional box used on this network has positions for only six 1,000,000-cir mils outgoing feeders. Standard limiters used in place of a junction box provide for eight outgoing circuits up to 500,000 cir mils. Two limiters can be used on the same phase to provide 16 outgoing positions if required.

At street intersections, limiters providing 9 or 13 positions for cable sizes up to 500,000 cir mils are used. Any single circuits requiring more than 500,000 cir mils are supplied by paralleling conductors. In unusual cases additional limiters may be paralleled with the main feed, giving any number of circuits required.

Details of Installation

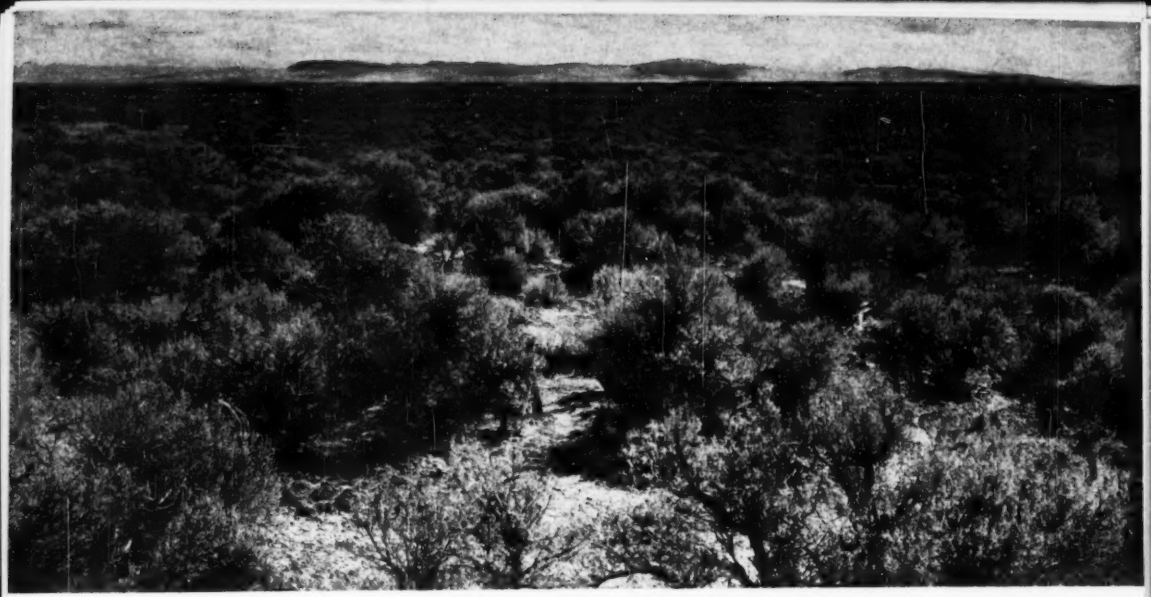
Regular cable splicing crews were trained to make the installations. The molded body of the limiter is mounted on a large cable hanger. Cable—either lead, rubber or synthetic covered—is stripped and the current-limiting link pressed on with an 18,000-psi hydraulic press. The other end of the link is attached to the body of the limiter with a cone sleeve compression joint. For impregnated paper-insulated cables, silk tape is used over the paper between the lead and limiter. It is lacquered as it is applied in order to create an oil stop. A split hard-pressed asbestos shell to confine the arc is then placed around the link and held in place by a covering rubber sleeve. The whole joint is taped with rubber tape or its equivalent; then completely covered with weather-resistant splicing tape.

Ultimately it is planned to install limiters on service cables at mid-block positions. Interruption of service will then be limited to a very minimum number of circuits immediately adjacent to a fault. With increased reliability more and more important to good customer service, adoption of some such economical and flexible protective system is well-justified.

Garden in the Desert

THE STORY OF COOPERATION ON THE SNAKE RIVER

ELECTRICAL WORLD
January 15, 1949



"... water is the key to the

Government enterprise and private enterprise have worked together on Southern Idaho's Snake River. Between them, they helped turn wasteland into homes for 250,000 people—and the source of food for many more

CIVILIZATION FLOATS through Southern Idaho on the Snake River. Whether civilization remains in this desert-ringed valley, or whether it floats on down to the sea and turns the Snake River country back to the desert, is beyond the control of man. While the Snake flows, those who settle along it prosper—sometimes, as now, beyond easy belief. But if the Snake vanished, there'd only be some hundred more miles of desert.

The valley is utterly dependent on the irrigation waters of the river. That seems improbable, perhaps, to the vast majority of Americans who never have to think twice about water supply. But it's no fiction. And because it isn't, water, and the right to use it, are the most important non-human elements in the valley.

Primarily, the Snake River valley is an agricultural community. As is happening in so many other regions, this valley is industrializing somewhat—and with great promise. But its foremost assets are a rich volcanic soil, a superb growing climate, and the waters of the Snake and its tributaries.

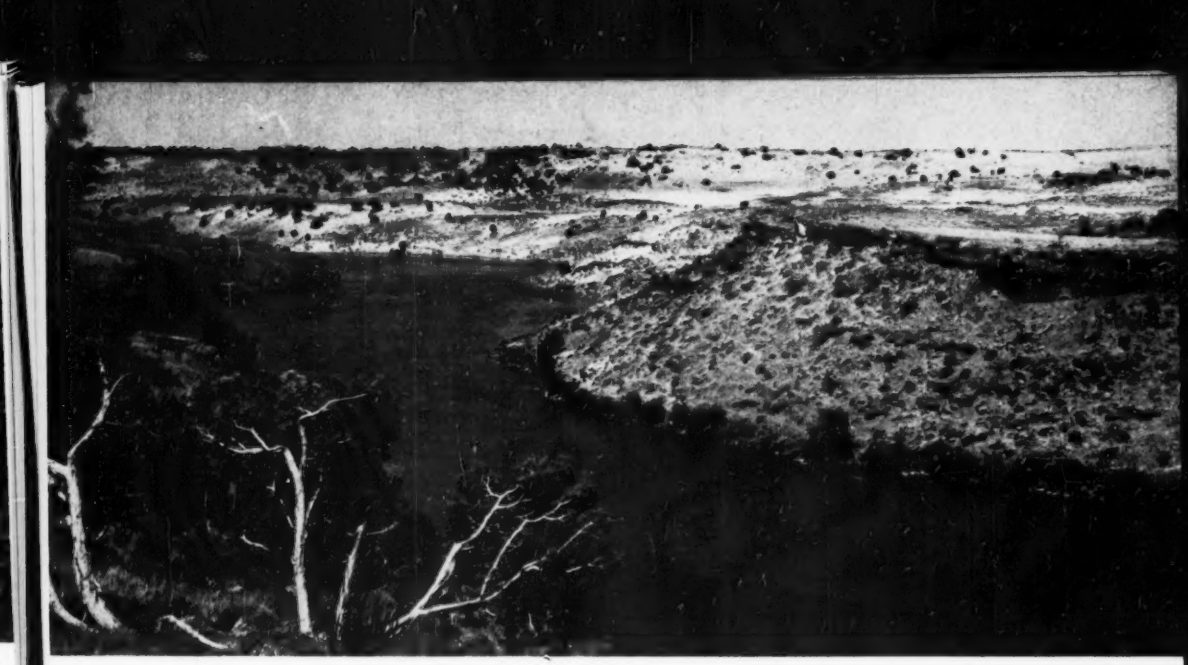
Here, the agriculture is one which draws its water up from the river, not down from the skies. Rainfall ranges from 8 to 12 inches yearly, and that can't even cover all the ground with sagebrush, let alone crops. Any crop that grows according to plan in the Snake valley—beyond some winter wheat—grows because someone diverted water from the river to the land—or pumped it from wells.

Water Law Is Strict

Water being the key to life in Southern Idaho, strict rules govern its use. First preference goes to domestic and stock consumption, of course. Thereafter, water for irrigation is sacred. (In specifically-organized mining districts, water for mining rates this second preference). It's only after the householder and the farmer have had their crack at it that any other water user enters the picture. Power, mining and manufacturing are lumped in a final category, and there's no fooling about it. Happily, the use of water for power doesn't diminish the water available for irrigation, although it may govern where it is available for irrigation.

Water's practical and legal importance in Idaho has drawn a spectacular response. People react to the problems of water use in a way which transcends mere obedience to a law through the fear of penalty. Rather, they act on a broad realization that water is the key to the whole development—and there isn't enough of it easily available for anyone to be selfish with it.

It's easy to get specific about this. Consider how the waters of the Boise River are distributed. Water rights on



whole Idaho development."

this stream were established by a court order signed in 1906. These rights date from 1864 to 1904. They were affirmed by the state supreme court, but the case was sent back to the lower court to answer a technical question. No final order in this case ever has been signed. Instead, from 1906 through 1919, orders were signed frequently, stipulating how much water could be delivered to the holders of Boise River water rights under the 1906 order.

Share and Share Alike

In 1919, one judge wrote an order which has endured to this day. It provided that all the water called for by the 1906 order should be delivered each year to the holders of Boise River water rights. But it provided also that when there wasn't enough water to meet all the rights, all water users covered by the 1906 decree would be cut on a uniform scale, from the latest right to the earliest. Only when deliveries had been reduced to 60% of normal would any water user be cut off completely in favor of the holder of an earlier right.

This device might not seem unusual to those who have no concern about water supply. Indeed, it might seem the most logical answer possible. But the fact is that it's an extremely unusual way of handling water rights.

Water rights in the arid west are very real and important things. First man on the stream has first call on the water he can use properly. Later arrivals use water subject to the rights of those who preceded them.

But on the Boise, the ordinary pattern has been reversed—voluntarily. Holders of rights having as much as 10 years' priority take the same cuts that everyone takes. They do it so that everyone may have a chance. They could upset this system without difficulty, merely by applying to the court for a final order on the 1906 case. Legally, that case is still open. Water law being what it is, the holder of an early right who didn't want to take a cut ranging up to 40% of his right so that the holder of a later right might get water would merely have to petition the court for a final order. No one has done so in 29 years. This spirit of "live and let live" is hailed by Boise River Watermaster William E. Welsh. "It exemplifies," he says, "the splendid spirit of cooperation which exists among all of the water users of the Boise River valley."

This acceptance of the Boise apportioning order isn't the only specific evidence of cooperation in the Snake River valley. A second—perhaps even more striking one—arose just a few years after the 1919 formula was pronounced.

By that time, there was a good deal of irrigation on the Snake River. Two big projects were in operation on the middle Snake—a privately-financed development at Twin Falls, where about 365,000 acres are irrigated, and the U. S. Bureau of Reclamation's 182,205-acre Minidoka project a few miles above it.

The American Falls Dream

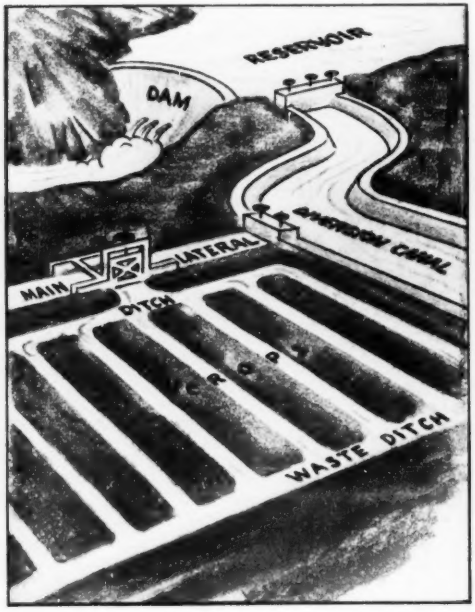
Neither of these projects was in high gear. The answer, inevitably, was water. Things were fine during the early months of the irrigation season—which runs from April through September. But as the melting-snow floods of the Snake receded and crops matured, it always seemed that there wasn't quite enough water, either in the river or the then-available reservoirs, to carry an increasing number of irrigators through the heavy months of watering the land.

"..once it's irrigated, yields are excellent."

THE IRRIGATOR'S big problem is to be assured of enough water at the right time. It's to insure this that the Reclamation Bureau was organized, as well as the irrigation districts, cooperatives and similar agencies. But once water has been delivered to the high point on his land, the farmer is on his own. To get the water to the crops, he has developed an intricate distribution pattern, based almost entirely upon gravity. Generally speaking, a "lateral" is used to conduct water from the main canal. Then a number of "head ditches" connect the lateral to the field. Each ditch serves perhaps 15 or 20 "corrugations"—the gullies which run between crop rows. Where the slope isn't just right for distribution, small dams are built in laterals and head ditches to raise the level enough so that water can flow where it's wanted. In season, the irrigator is rarely seen without his long-handled shovel. It builds or removes dams, diverts water, cultivates crops. In earlier days, it was Idaho's version of the six-shooter when arguments developed over the ownership of life-giving water.

Irrigation starts early . . .

Here's a field of peas early in the irrigation season. While run-off remains high, water supply isn't a problem. Later in the season, storage reservoirs will have to fill water needs



LONG ROWS of crops with tiny streams of water between them are a trademark of irrigation. This diagramatic sketch shows a typical method of getting water from a reservoir to a field, through a series of canals, successively smaller ditches, dams, headgates, siphons, etc. Object is to let water run downhill

is a painstaking job:

Some irrigators use plastic or rubber tubes to siphon water from head ditch to corrugations. Alternative is small channel to each row of crops. Tubes permit even application of water

takes much checking . . .

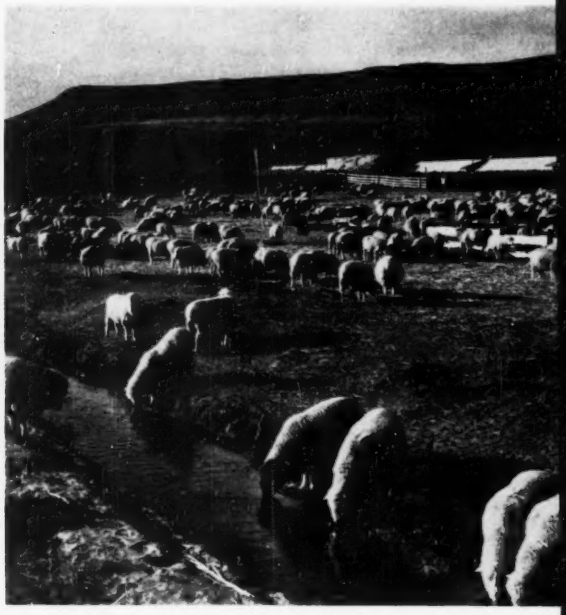
This 40-acre field is devoted to Idaho's best-known crop—potatoes. As season progresses, the irrigator does a lot of checking to insure careful use of limited water supply

isn't easy work . . .

Irrigator Dave Frost is building a canvas dam to spread out the water in his 40-acre alfalfa field. Unlike row crops, pasture crops are flooded direct from ditches, not from corrugations

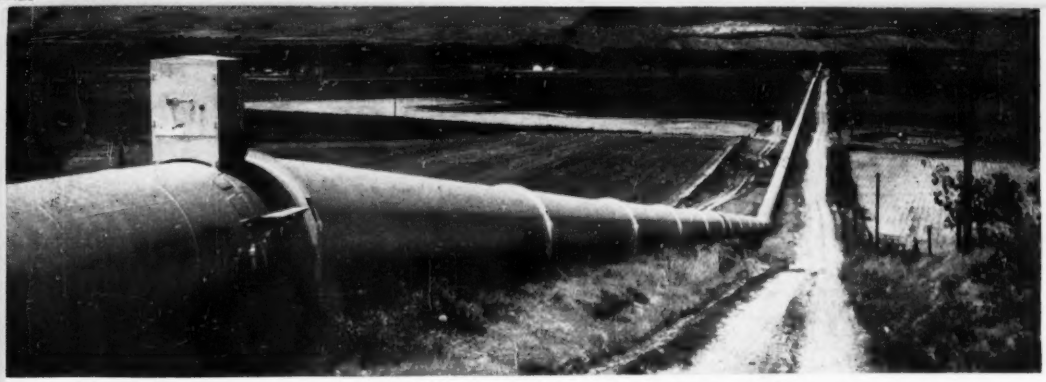
but production's high . . .

Extra work involved in irrigated farming has its reward. This onion crop gives an idea of the high yields that are possible. Superb climate, rich volcanic soil make Idaho agriculture pay



and income good

Sheep raising and cattle finishing are important contributors to Snake valley's agricultural income. The land, brought to life by irrigation water, supports a large cattle population



ONE FEATURE of the Reclamation Bureau's Owyhee project, in eastern Oregon just across the Snake River from Idaho, is the Malheur Siphon. It's a 4.5-mile steel tube which moves water from storage to fields which can't be reached by gravity flow

It didn't take much looking for the irrigators to turn up with the answer. About 40 miles upstream from Minidoka there was a reservoir site which promised to hold back enough water to straighten things out below. Under federal reclamation law and the tangled financial conditions which surrounded both the Twin Falls and Minidoka projects then, it wasn't going to be easy to finance that reservoir—American Falls. But storage there was the answer and the irrigators determined to have it.

There were three power plants at the site, owned by the Idaho Power Co. The company also owned much of the strategic land in the reservoir site and enough valid water rights to conflict with any irrigation storage there. Of course, this wasn't insuperable, for laws existed under which all of this could have been condemned. Still, condemnation wasn't the preferred answer. For one thing, a lot of irrigators could go broke while litigation wound its weary way through court after court. And the exercise of eminent domain often entails heavy payments in settlement of damages to those whose property is taken. In 1920, the irrigators had problems enough financially without maintaining expensive litigation or paying heavy damages.

The answer to this tangle was a contract in 1923. Idaho Power turned over to the Reclamation Bureau two of the three generating plants it had at American Falls, the land it owned in the reservoir site and its water rights there. In return, it got about $1,000,000 in cash and some bob-tailed water rights. For practical purposes, USBR took control of the river there.

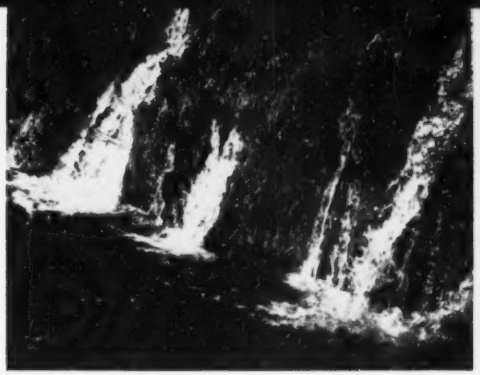
A second strategic contract came 11 years later, in 1934. It grew out of a failure of American Falls Reservoir—which had been enabled to be built by the 1923 contract—to meet completely the needs for which it was built. Considerable water was being passed through American Falls Reservoir each winter for power generation at Reclamation's Minidoka power plant 40 miles downstream. American Falls hadn't filled for several years, with consequent losses to the irrigators each subsequent summer.

SHOSHONE FALLS, shown here early in the irrigation storage season, is 212-feet high, has 12,500 kw power plant at left. Lava canyon walls are typical of the Snake gorge

The problem was complicated by Reclamation's commercial power business on the Minidoka project. If Reclamation stopped its winter generation at Minidoka, it would destroy a profitable enterprise which was helping pay the cost of its irrigation works there. If it didn't stop winter releases of water it otherwise could store at American Falls, summer irrigation water would be insufficient. The 1934 contract gave the answer.

Two Birds . . . One Stone

Under it, Idaho Power agreed to give the USBR system at Minidoka such power as it needed from Oct 1 to April 1 yearly, without charge. This would enable the Minidoka plant to be shut down almost completely during these months, and thus eliminate the releases at American Falls. At the same time, it furnished Reclamation enough power to carry on its commercial power business at Mini-



HUNDREDS of springs gush from lava canyon wall into a concrete flume set into a cliff at IPCO's Thousand Springs power plant. At flume's end, water drops 180 feet through steel penstocks to power house. Then it is switched into the Snake

doka. IPCO agreed also to give Minidoka 4,000 kw of power without charge from April 1 to Oct. 1. This would help USBR's limited Minidoka plant carry its growing summer load, which consisted of commercial business and seasonal irrigation pumping load. Idaho Power also further depreciated the contractual water rights it got from the 1923 contract.

Something From Nothing

In return, Idaho Power, after paying part of the winter operating costs, got from Reclamation the winter generation at a USBR power plant which had been built at Black Canyon, 185 miles away from Minidoka on the Payette River, at the opposite end of the IP system. In summer, Black Canyon generated power for irrigation pumping. Since there was no irrigation storage there, and since little if any water need be pumped for the irrigators during the winter, the plant figured to stand idle at least half the time. Its capacity during non-irrigating months couldn't be sold commercially by USBR since it was committed to irrigation pumping several months a year. But Idaho Power needed capacity at that end of the system. And it encountered its greatest demands for power in the winter, when Black Canyon ordinarily would stand idle. So the deal was an excellent one for both parties. It saved additional investment in unnecessary facilities by each party, and it made full use of existing facilities. That meant lower-priced electricity for IP's customers and more power revenues to help amortize irrigation investment for the irrigators.

Even the United States District Court for the District of Columbia thought it was a good deal. In dismissing a suit brought by the Burley Irrigation District (Burley, one of two districts on the Minidoka project, didn't like the revised split of Minidoka power profits which followed the 1934 contract) the Court said:

"The conservation plan which was put into effect by the Secretary of the Interior under the aforesaid contracts . . . resulted in numerous and important benefits not only to the United States but also to the farmers of the Snake River valley, to the Minidoka project, to the Idaho Power Co and to the Burley Irrigation District."

Working under these contracts, both Reclamation and Idaho Power have avoided the animosity and struggle which characterizes relations between federal power development agencies and commercial power systems in many other localities. Each keeps the other informed. Capital is not wasted, but rather used more effectively. And the maximum use of developed water is made for effective irrigation and low-cost power.

Results of this cooperation in tangible benefits to the people of Southern Idaho aren't hard to find. Assured of a market on the Idaho Power system for any energy it may develop beyond that required for irrigation loads, Reclamation has been free to put its effort into getting more land into cultivation—more families settled on the land. This last is the fundamental assignment of the Reclamation Bureau.

TWIN FALLS, with 9,375 kw underground power plant, is in central Snake Canyon. Operator's home, at far right, is itself deep in the canyon. Falls are 188 feet high

Snake Power Plants from Oxbow to the Headwaters

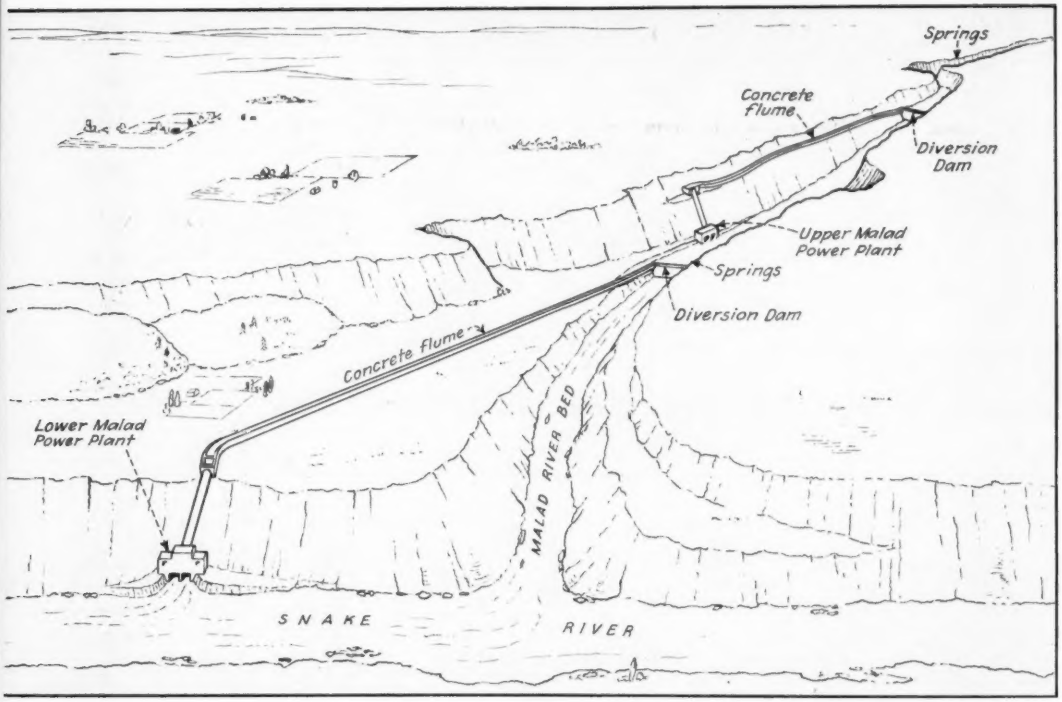
Name of Plant	Stream	Ownership	Rated Capacity Kw	Head Ft
Oxbow	Snake River	IPCo	600	20
Black Canyon	Payette River	USBR	8,000	93
Swan Falls	Snake River	IPCo	11,000	25
*Bliss	Snake River	IPCo	69,000	70
*Lower Salmon	Snake River	IPCo	60,000	60
Upper Salmon	Snake River	IPCo	34,500	85
Clear Lake	Clear Lake Springs	IPCo	2,100	79
Thousand Springs	Thousand Springs	IPCo	7,600	182
Shoshone Falls	Snake River	IPCo	12,500	212
Twin Falls	Snake River	IPCo	9,375	145
Upper Malad	Malad River	IPCo	7,200	125
Lower Malad	Malad River	IPCo	13,500	135
American Falls	Snake River	IPCo	27,000	49
Idaho Falls	Snake River	City	2,400	21.5
Idaho Falls, Middle	Snake River	City	2,000	20
Idaho Falls, Lower	Snake River	City		
Ashton	N. Fork Snake	UP&LCo	5,800	47
St. Anthony	N. Fork Snake	UP&LCo	500	13
Horseshoe Bend	Payette River	IPCo	1,800	35
Barber	Boise River	IPCo	1,050	25
Diversion	Boise River	USBR	1,800	32
Cascade	Payette River	IPCo	300	36
Minidoka	Snake River	USBR	13,400	51
Bellevue	Wood River	IPCo	600	36
Salmon City	Lemhi River	IPCo	750	36
PROPOSED				
Palisades		USBR	45,000	
Scriver Creek (2 plants)		USBR	120,000	
Garden Valley		USBR	45,000	

*Under construction. Will be in operation in 1949 and 1950.

Snake Reservoirs from Jackson Lake to Oxbow

Reservoir Name	Active Capacity	Ownership	Reservoir Name	Active Capacity	Ownership
Jackson Lake	847,000	Joint Use	Somerville	2,000	Private
Henry's Lake	79,351	Joint Use	Antelope	33,630	Private
Island Park	127,300	U S B R	Upper Cow Creek	3,100	Private
Gray's Lake	30,000	Indian Service	Lower Cow Creek	3,600	Private
Blackfoot	413,000	Indian Service	Owyhee	716,000	U S B R
Grassy Lake	15,200	U S B R	Warm Springs	170,000	U S B R
American Falls	1,700,000	U S B R	Agency Valley	60,000	U S B R
Lake Walcott	95,200	U S B R	Willow Creek	26,000	U S B R
Goose Creek (Carey Act)	74,350	Oakley Irrig Dist	Unity	25,200	U S B R
Salmon Creek (Carey Act)	182,650	Salmon Irrig Dist	Deadwood	161,900	U S B R
Cedar Creek (Carey Act)	28,200	Roseworth Irrig Dist	Payette Lake	40,000 (Approx)	Emmett Irrig Dist
Little Camas (Carey Act)	24,000	Mt. Home Irrig Dist	Cascade	700,000	U S B R
Magic Reservoir	191,500	Idaho Irrig Dist	Crane Creek	50,000	Crane Creek Dist
Anderson Ranch Dam	464,200	U S B R	PROPOSED		
Arrowrock	286,600	U S B R	Palisades	1,400,000	U S B R
Long Tom	4,000	Mt. Home Irrig Dist	Lucky Peak		Army Eng.
Deer Flat	169,000	U S B R	Garden Valley	1,250,000	U S B R

Rearranging the River



UNCONVENTIONALITY is conventional in handling the Snake's flow for power generation. This diagram, and the picture above it, show the 3.5-mile Malad River and two unattended power plants. Source of the water is a series of springs high in upper end of this blind canyon. Concrete flumes carry water to the power houses and on into Snake in the foreground

Representative Industries in Idaho Power Company Area

Classification	Name of Firm	Location	KW Demand*	Annual Employes*	Annual Payroll*
Mining	Bradley Mining Co.	Stibnite	2550	225	$800,000
Cement	Idaho—Portland Cement Co.	Pocatello	1250	50	‡
Lumber	Boise—Payette Lumber Co.	Emmett	2000	380	1,250,000
Brick	Campbell—Child Brick Co.	Boise	175	12	40,000
Food Processing	J R Simplot—Food Processing Division	Caldwell	1050	600	1,100,000
Butter	Ada County Dairymen's Assn.	Meridian	485	80	200,000
Milk Condensery	Sego Milk Co.	Pocatello	550	65	170,000
Cheese	Kraft Cheese Co.	Pocatello	200	200	‡
Sugar	Amalgamated Sugar Co.	Twin Falls	1100	250	200,000
Flour	Twin Falls Flour Mill	Twin Falls	275	50	150,000
Starch	Magic Valley Processing Co.	Twin Falls	375	15	66,000
Meat	Idaho Meat Packers, Inc.	Caldwell	150	40	130,000
Poultry	Idaho Egg Producers	Caldwell	100	125	225,000
Seeds	Crookham Co.	Caldwell	175	50–200	300,000
Feed	Ralston—Purina Mills	Pocatello	285	40	‡
Fertilizer	J R Simplot—Fertilizer Division	Pocatello	1200	200	‡
Containers	Caldwell Box Factory	Caldwell	375	100	330,000
Oil Refinery	Wasatch Refining Co.	Pocatello	200	95	‡
Foundry	Baxter Foundry	Boise	125	40	110,000
Transportation	U P Railroad Yards	Pocatello	1850	3300	‡
Steel Products	Olson Manufacturing Co.	Boise	400	150	500,000

* Approximate ‡ Not available

In the territory where Idaho Power and USBR have been cooperating in the development of a river, Reclamation has developed three large projects of its own. These, which are in addition to all the land on which it dumps supplemental water, are the Minidoka project, with 182,205 acres irrigated; the Boise project, with 171,404 acres irrigated; and the Owyhee project, just across the Snake in easternmost Oregon, with 91,854 acres irrigated. There are 9,345 farms on these projects, with a farm population of 35,100. Tributary are 34 towns with 105,037 people.

For a country which was sagebrush wasteland a few decades ago—and which would return to desert in short order if the water were withdrawn—these are impressive totals.

New Gardens to Bloom

To achieve this program, Reclamation, by 1940, had invested $41,868,781 in Idaho, of which $29,581,196 was for new land, the remainder for supplemental water projects. A lot has been added since, and there's an ambitious new program laid out.

In the near future, Reclamation plans Palisades Reservoir, close to the Wyoming-Idaho line, storing 1,400,000 acre-feet and generating 45,000 kw; the Garden Valley Reservoir, near Boise, with 1,330,000 acre-feet of storage and a 45,000 kw plant; a 4.6 mile diversion tunnel connecting the North Fork of the Payette River and Garden Valley through Scriver Creek, where two power plants of 120,000 kw total capacity are planned; and the Mountain Home irrigation project, south of Boise. Here, 400,000 acres can be brought to use. Initial plans call for the irrigation of 230,000 acres. To achieve this, it is planned to transfer water from the Payette to the Boise River; then transfer some Payette and some Boise water to the Mountain Home project. It will take several tunnels, totalling about 30 miles, long canals and some flumes. Pumping plants will be needed to lift water from the Boise river to the project levels.

Idaho Power, like Reclamation, has been enabled to do a magnificent job for the people of its territory as a result of the cooperation which has marked the joint USBR-IPCO development of the central Snake valley.

The way Southern Idaho people use electricity is eye-opening. In 1948, the average residential customer used 3,637 kwhr, which is 2.4 times the 1948 national average residential use. IP's average farm customer used 4,098 kwhr. Farmer and city dweller pay identical rates. They averaged 1.79 cents for residential, 1.75 cents per kwhr for farm customers, or 60% of the 1948 national average price of 3 cents per kwhr.

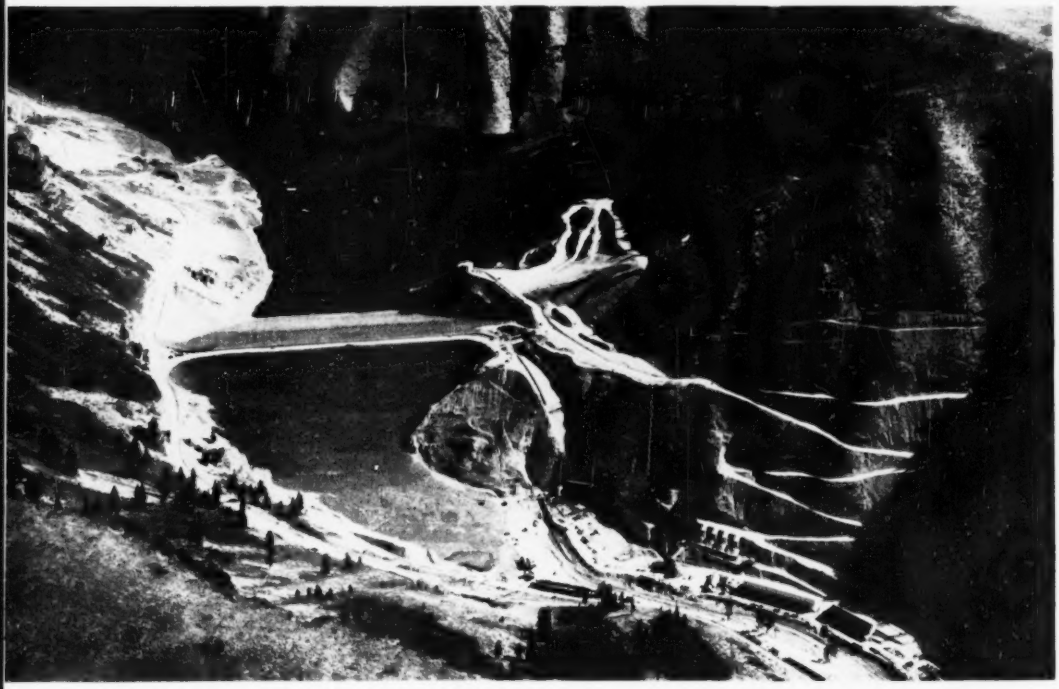
How to Use Power!

Very high use per customer, of course, is one reason for these very low rates. The astonishing extent to which IP customers use electric ranges and water heaters helps build consumption. Seventy-five percent of residential and rural customers use electric ranges—55% of them water heaters. It's true that one reason for these startling saturation figures is the fact that coal, oil and natural gas all are foreign to the area. Still, Idaho Power was promoting these appliances vigorously two decades ago—won a trophy for it in 1934.

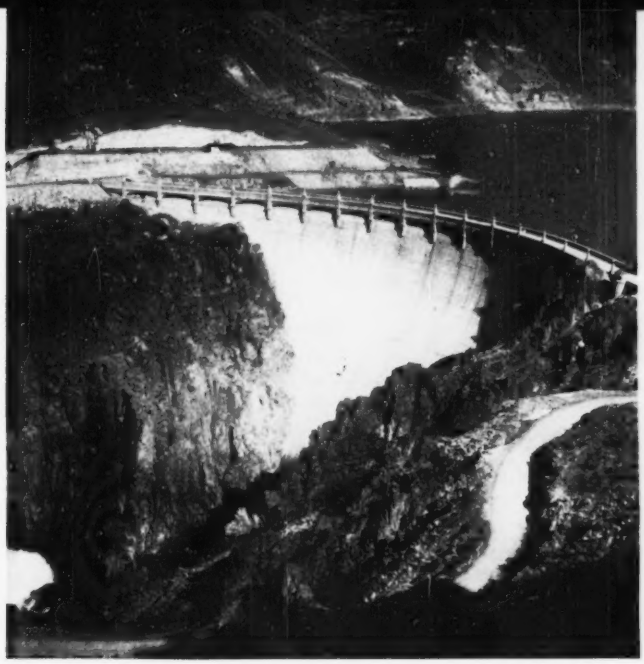
In the territory IP serves, 98% of all farms are electrified, a figure well ahead of the national average.

For all this superb electrical development, the federal power planners have looked speculatively at Southern Idaho. Various federal agencies have planned transmission systems which could upset Reclamation's traditional role in the area. But Congress has given no funds for these purposes.

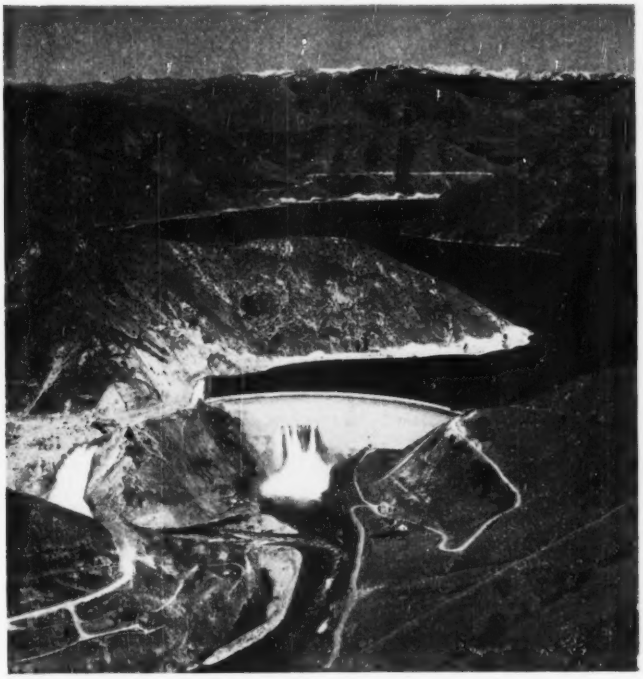
AMERICAN FALLS RESERVOIR, near Pocatello, holds key to central Snake irrigation. Its 1,700,000 acre-foot capacity is used jointly by USBR's Minidoka project, irrigation districts and Idaho Power Co. Latter has power plant just downstream



ANDERSON RANCH DAM and reservoir, just completed near Boise, is rolled-earth structure. A 27,000 kw power plant is being built there. As pictured, dam is by no means full. It will store water for Boise project, generate power for pumping



OWYHEE RESERVOIR, in eastern Oregon, is key structure of Reclamation's Owyhee project. It has an active storage capacity of 715,000 acre-feet, but has no power plant



ARROWROCK RESERVOIR, on Boise River, is purely for storage, generates no power. With two others, it provides primary and supplemental water for Boise project

"...Reclamation's record in Idaho is impressive."

IDAHO'S first irrigation ditch began dumping water on the land in 1837, but it wasn't until 1860 that a permanent settlement was founded. Today, 2,500,000 acres in the state are irrigated. Most of this has been done by private capital. Today, Reclamation has 445,463 acres irrigated in three projects on the central Snake.

In Idaho, if you tickle the land with an irrigation ditch, it laughs with a harvest, and the yields are tremendous. Grains, potatoes, sugar beets, hay and feed, fruits and dairy products, onions, peas and beans are the most important crops of the Snake valley. There's a lot of cattle finishing in some sections. At the western end, dairying and fruit growing are strong. There's a flourishing seed industry, too. As high as 85% of the country's hybrid sweet corn seed has been produced there in one year, along with substantial portions of the U. S. supply of onion, sweet corn, carrot, lettuce, sugar beet, clover and bean seed. Seed processing offers many jobs.

Weather's No Worry

Irrigators say the extra work of putting water on the land is offset by their freedom from nature's whims. One county on a USBR project boasts onion yields as high as 1,100 sacks (100 lb) per acre. Potato yields run as high as 600 sacks (100 lb) per acre; wheat, 40 to 90 bushels; corn, 55 to 130 bushels; beans, 28 to 65 bushels; carrots 320 bushels; and melons, 20 to 40 tons. In 1947, Gooding county averaged $210.25 per acre from the land it devoted to sugar beets, and bean crops there have yielded $250 per acre. It's hard to go broke farming with yields like these and prices at today's levels—and the territory certainly shows it.

For the future, Idaho looks to the irrigation of at least 1,300,000 acres more, and perhaps 600,000 beyond that. Perhaps as much as 6,000,000 acre-feet more water is available.

UPPER SALMON DAM and new power plant, owned by Idaho Power Co. is a good example of how the river is rearranged for maximum benefits. Real channel is at left. Diverted into the concrete flume at right, river produces much more power

For the future, the people of Southern Idaho are vitally interested in the broadest expansion of irrigated land. But the remaining projects are the expensive ones. They can't be accomplished without help from power sales because irrigation alone could not possibly liquidate the construction costs. Self-liquidation is most important, for the continuing merit of reclamation in the eyes of Congress is that it has never been paid for by the general taxpayer.

Congress, whose membership is predominantly eastern and middle western, can hardly be expected to subsidize either the farmers or the power users of the West beyond those who live elsewhere. To do so would give the westerners a competitive advantage over eastern constituents. The people who want irrigation recognize this political fact. They are proud of the pay-off on existing projects—a record which approaches 100% in southern Idaho.

Why Give Market Away?

So Southern Idaho has a prime concern in preserving its power markets for Idaho projects which will let irrigation grow. It gets exactly such a market from Idaho Power, for IPCO will take by-product Reclamation power, whether firm power or not. And it will take this power at a price competitive with the cost of building its own generating facilities. Once, recently, Congress ok'd a Reclamation project in the valley where the price IPCO offered was twice what the government receives for the power it wholesales through the Bonneville Power Administration. It was sound business for Idaho Power because the price was competitive. If accepted, it would be wonderful for the irrigators because of the help it would give them in repaying construction costs. It was a sparkling offer of cooperation.

Bonneville Unattractive

It's a record like this which helps explain Southern Idaho's disinclination to embrace an expansion of Washington-Oregon's Bonneville transmission grid into the Snake country. The irrigators know that power sold under BPA marketing standards won't yield the revenues for the repayment of irrigation construction costs that could be had from power sold otherwise.

(Some of them, also, wonder how Bonneville, which serves the real power shortage area of the United States, can be so blithe about taking over the power supply of an area which has no shortage—Southern Idaho.)

Change a Winning Game?

On the record, there just isn't much reason for the people of Southern Idaho to buy the change in their power supply set-up which some federal plans would entail—namely, supplanting IPCO service with a conglomeration of federal, municipal, and cooperative service. For them to welcome such a change, there'd have to be some advantage. To find such advantage, it would take a lot of looking throughout Southern Idaho. For instance, with 98% of the farms in its territory electrified and receiving excellent service at an average rate of 1.75 cents, there isn't much reason to expect that these customers will flock to co-ops, whose average rate nationally in 1947 was 3.41 cents.

As for municipalizing the city distribution systems in the area, the prospects aren't much brighter. The easy way to do this is through the

Reclamation Leaders Say . . .

IDAHO'S Gov C. A. Robins, who administers laws governing water use, says state presents "one of the finest examples of what may be accomplished in the field of reclamation by full cooperation between the Bureau, state and local agencies and private interests. Our significant progress in this respect is largely due to cooperation."

STATE Reclamation Engineer Mark R. Kulp supervises opening of new land to irrigation, issues permits for appropriation of waters as yet unused. He lauds joint development of the Snake River, says "cooperation between the Bureau of Reclamation and the Idaho Power Company met power demands and saved water for irrigation."

WATERMASTER of the Boise River and executive secretary of the Idaho State Reclamation Association, William E. Welsh foresees vast expansion of reclamation in Idaho. Only two states have more land irrigated, he says, adding that Idaho "has perhaps greater opportunities for further development than any other state in the west."

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sale of revenue bonds. These are not constitutional in Idaho. Granted that constitutions can be changed, it takes a lot of doing—and a lot of public support. You can find considerable evidence in Southern Idaho these days indicating that such support won't be forthcoming.

Of course, a lot of power can be sold to industrial customers—if you have them. And Idaho stands to get some good ones, primarily chemical plants who'll use a lot of power. But the nature of the prospectively substantial chemical load in Idaho is such that it takes a lot of capital to serve it and doesn't yield much of a return. Should the government take all of it, Idaho Power wouldn't be losing a great deal. And so far, such of it as exists is served by IPCO, which intends to be in a position to serve all the rest when it arrives.

No Investment Fears

But even beyond these factors, there is a stronger reason why Idaho Power faces the future with confidence and an undiminished willingness to spend all the money necessary to assure Southern Idaho the best possible electric service.

That reason is simply that anything which has paid off so handsomely as the Idaho Power-Bureau of Reclamation cooperation in the development of the Snake River just ought to go on.

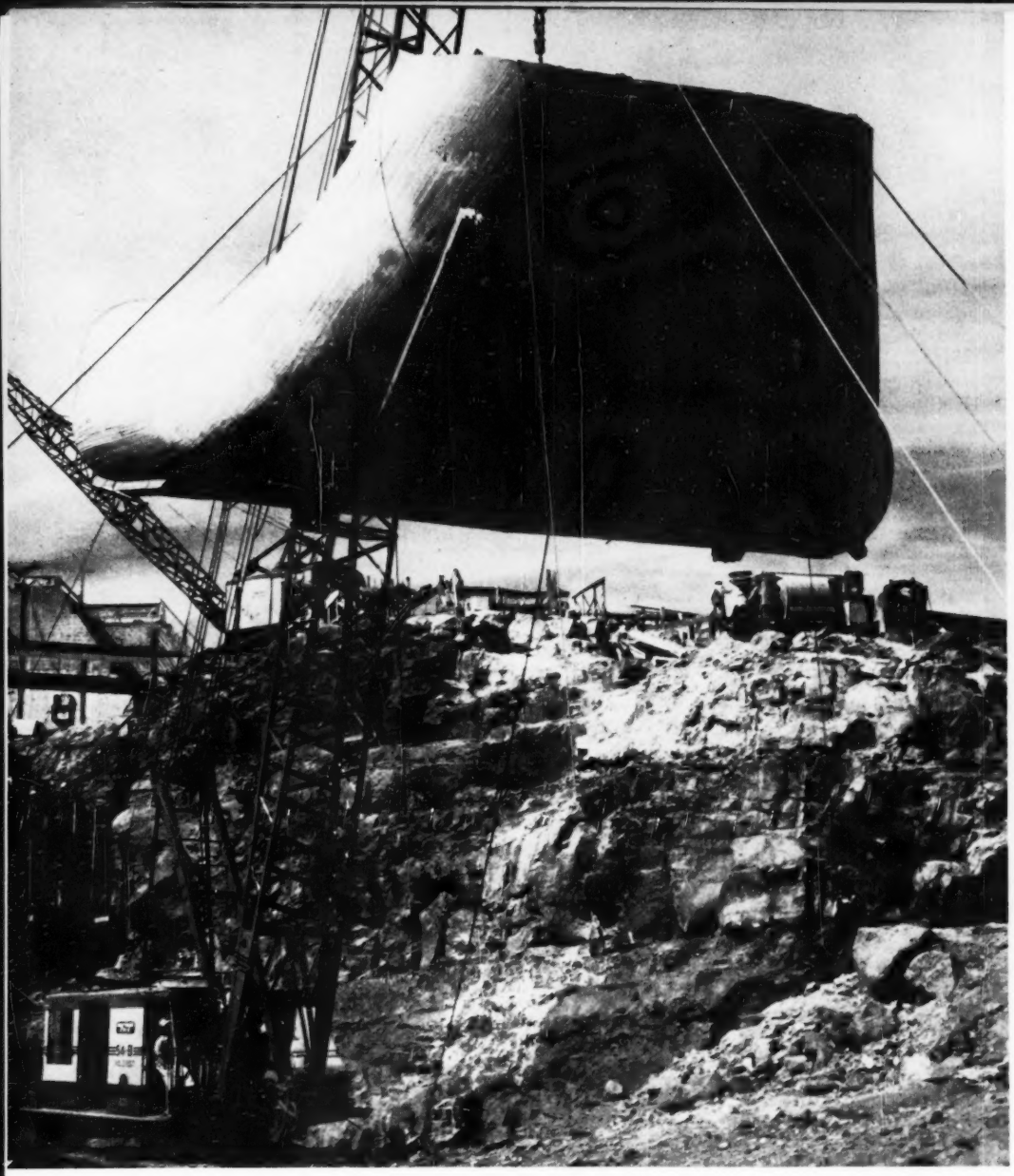
Under that joint, cooperative development, Southern Idaho has prospered. Certainly, new land has been developed, yielding new homes, new population, new business, new industry. If the people of Southern Idaho want their region to grow and prosper—and it's ever so plain that they do—they can be expected to think carefully before deserting a device which has helped the area do just that.

How Does It Compare?

As we have seen, electric power is distinctly secondary to water as the key to development of the region. Yet what else would do a better power job for Southern Idaho than has already been done? Certainly, TVA hasn't done a better electrical job for its territory. There, 55% of the farms are electrified. In Idaho Power territory, it's 98%. Average residential use in the TVA area as of last Sept 30 was 2,543 kwhr yearly, average farm use 1,665 kwhr. In Idaho Power territory, the figures as of one month later were 3,637 kwhr for residential consumption, 4,098 kwhr on farms. TVA's average residential rate per kwhr—1.58 cents—was two mills better than IPCO's average residential rate, 1.79 cents. But Idaho Power's average farm rate of 1.75 cents was two mills better than TVA's average farm rate of 1.98 cents. All the taxes IPCO pays—state, local, and federal—average 3.6 mills per kwhr. The comparable figure for TVA would be much smaller since TVA pays only a portion of its power revenues in lieu of state and local taxes, and pays no federal taxes at all. IPCO's taxes have amounted to as much as 30% of its gross revenues.

Cooperation Paid Off

Altogether, the prospects for destructive competition are small, while the prospects for regional growth are tremendous. The feeling is strong—and sound—that the people of Southern Idaho have benefitted far too handsomely by a quarter of a century's cooperation to ditch it now. In Idaho, they ditch things to improve them, not to ruin them.

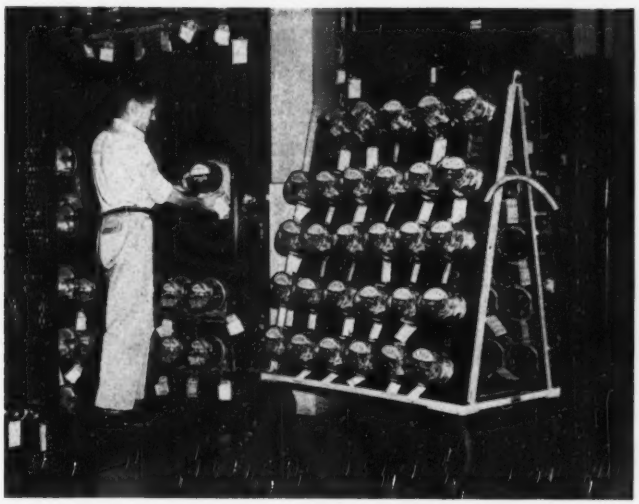


". . . there's much development to do."

The crane operator who's moving this wood form for a draft tube at Idaho Power's Lower Salmon development is only one of many construction men who are busy on the Snake. The valley is not completely developed, either for power or for irrigation. With Southern Idaho sharing fully in the nation's booming expansion of productive capacity, this unfinished development is really being pushed. Close to this site, Idaho Power has recently finished three new hydro plants. Not far below, it is well started on the 70,000-kw Bliss development, which will be the largest plant on the IP system. Bliss and Lower Salmon alone will add capacity greater than that with which IPCO went into the last war. With the three upstream plants already completed since the war's end, the net system expansion will be 155,000 kw, or one and one half times the prewar total. Total expansion will cost about $55,000,000, or almost 125% of what the company had invested before the war. And the end of IPCO expansion isn't in sight. Several new power sites are being explored as the company times its growth to meet the unslackened increases in demand. With a new chemical industry burgeoning, load expansion looks as if it will long continue

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Flexible Meter Racks Built of Expanded Metal



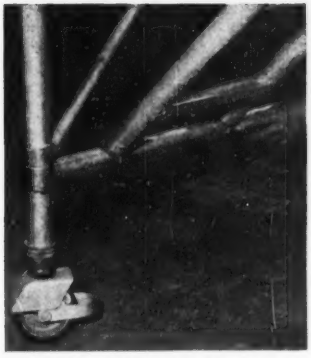
METAL MESH used on both the meter storage racks and the transfer cart allows meters to be hung at any convenient spacing. Mesh can be tightened periodically to eliminate sag

Because of the flexibility that it brings to the storage and transportation of meters of different size and type, expanded metal is used for both stationary and mobile racks at the meter shop of the Cleveland Electric Illuminating Co. Meters are hung from simple S-hooks spaced to suit the size of the meter.

The stationary meter storage racks shown in the accompanying picture are of ¾-in. mesh while the mobile A-frame cart uses ½-in. mesh. The mobile rack is mounted on 8-in. rubber-tired wheels and is approximately 2¼ ft wide, 4 ft long and 5 ft high.

There is a tendency for the metal mesh to stretch with time and sag on the frame. This sag can be taken out easily by twisting individual meshes progressively in rows across the rack. A forked metal tool has been used for this purpose, but it can be done just as well with pliers or an adjustable open-end wrench.

Portable Scaffold Speeds Construction



SPRING LOCKING PINS hold hook joints in place. Threaded legs are individually adjustable by a locking collar and an expanding nut for uneven ground or floor up to 24 in. Brake lever locks wheel and swivel

E. B. RYNN

Supt. Substation Construction
Southern California Edison Co
Los Angeles, California

Southern California Edison Co is using an ingeniously-designed portable scaffold for substation bus work and transformer racks. Their extensive program of substation modernization and expansion involves a wide variety of such work above ground level. Mobility and flexibility of the new scaffold equipment has saved more than half the time required to use conventional scaffolding.

Greatest advantage of the scaffold is that it is completely self-supporting, and can easily be moved while erected. It is made up of a base section, with adjustable platform height from 7 to 9 ft; half or full sections which add 3½ or 6 ft; and a safety railing 42 in. high.

The structure rests on four legs which are adjustable up to 24 in. for uneven ground or floor. Adjustment is provided by a locking collar and an expanding nut which allow sliding the threaded leg for easy adjustment. Upright casters on the legs have provision for locking wheel and swivel.

Scaffold Quickly Erected

Two men can erect the 13-ft combination most often used by Edison in about five min. The sections, which fold into a flat package 6½ in. thick, are made of heat-treated aluminum alloy tubing, and weigh only 52 to 64 lbs. Joints lock in

NEW • NEW • NEW

NEW

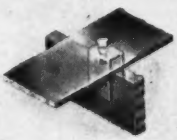
NEW RACK-OUT MECHANISM

Built-in rack-out bar and rollers provide a smooth and easy means of inserting the breaker, or withdrawing it to the test position. Thus, inspection is easy.

SAFETY INTERLOCK

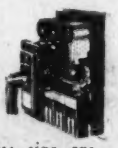
Mechanical safety interlock prevents connecting or disconnecting the new AK-1 air circuit breaker unless the breaker is in the "open," or "safe," position.

IMPROVED BUS CONSTRUCTION



Raised buses on AK-1 equipments mean longer creepage distance between phases; approximately double that of previous design. This feature cuts maintenance costs.

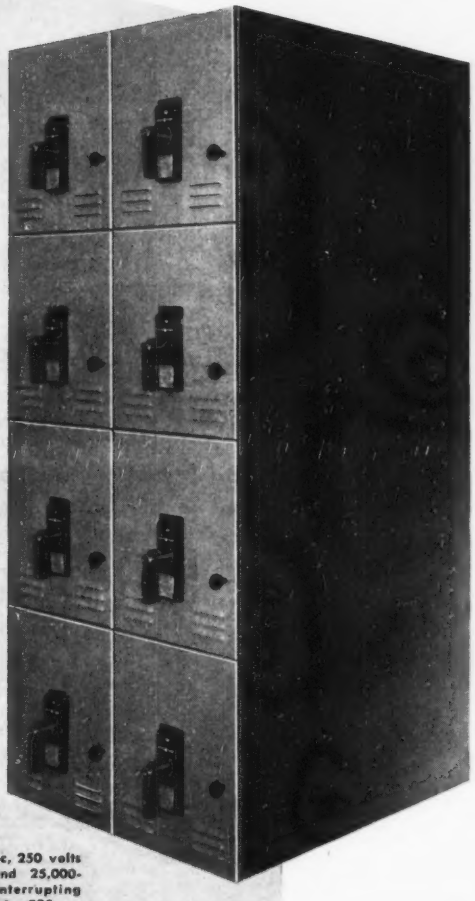
LOW INSPECTION COSTS



Breakers of the same frame size are interchangeable. For inspection, merely lift the bar and pull the breaker forward. All parts are readily accessible.

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

DRAWOUT SWITCHGEAR

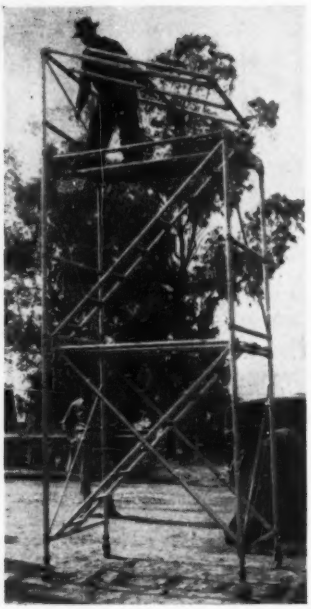


600 volts a-c, 250 volts d-c; 15- and 25,000-amperes interrupting ratings; 15 to 225, or 35 to 600 amperes.

WITH THE NEW AK-1 AIR CIRCUIT BREAKER FOR COMPLETE PROTECTION ON LOW-VOLTAGE SYSTEMS

These attractive new metal-enclosed units require less floor space than previous designs. Also, you now get four breakers—in the same height—where three were before . . . And you get plenty of "IC" (interrupting capacity) for the protection of your production, equipment, and personnel . . .With this new drawout switchgear you can set up completely selective power distribution systems that will eliminate costly production shutdowns caused by unnecessary main breaker tripping . . . Specify *this* switchgear *now* from your G-E sales representative. Write for bulletins GEA-4951 and 4966. "Selective Operation" is described in GET-1485. *Apparatus Department, General Electric Company, Schenectady 5, N.Y.*

GENERAL ELECTRIC



WORKING PLATFORM 13-15 ft high can be erected by two men in five min. Built-in stairways serve as diagonal braces for the sections. Worker is placing the 42-in. high guard rail around the 4½x6-ft platform

position with spring locking pins, as shown, so there are no wing nuts, bolts or other loose parts. A built-in stairway in each section serves also as a diagonal brace.

Edison has used the scaffold for constructing buses, making bus taps on suspended bus, cleaning oil circuit breaker bushings and for other construction and maintenance work.

•

Scheduling Pole and Line Inspection—V*

POLES LOCATED where people congregate are classified as in "hazardous areas." These include locations in or close by school yards, parks, public buildings, churches, etc. Record cards of such poles are provided with pink clips, as previously indicated. The power company's joint line representative is responsible for selecting from such cards the poles due for butt inspection. This includes making out proper slips.

Each April such poles are butt-inspected. This takes the place of the regular butt inspection schedule. The result of the above inspection is given to the superintendent of distribution immediately after completion. Each year the joint line representative of the power company keeps up to date a map of the territory showing the route to be followed by the line inspector.

Report Practices. While these are based in detail on the company's own system routine, a few major points of general application may be mentioned. The line inspector reports daily all matters relative to butt inspections and steel poles. These reports are received by the joint line representative of the company, who examines each one. Where a pole is to be renewed one copy goes to the maintenance engineer and one to the draftsman in charge of maps. If no renewal is required, the original pole record slip goes to the latter only. This has to be done within one working day from the time the line inspector turns in the slip. (Typical pole record card was shown in the first article of this series).

Undesirable Conditions Covered

Comprehensive coverage of undesirable conditions is given on the company's "Line and Service Inspection Report" form, shown in the second article of this series. This form is 5½ x 7½ in., a good size for field work. The joint line representative receives and examines these reports daily routing them to departmental supervisors, i.e., those involving line work go to the maintenance engineer; reports of thermotels tripped go to the maintenance supervisor.

Pole Replacement Orders

Work orders are made out and returned, signed and dated as to start of work, to the joint line representative with report of action taken. Work orders must be made out within five full working days after receipt, by the maintenance engineer, of notice for a pole condemnation or for repairs or other line work. This also means starting preparation of plans, getting permissions of property owners, etc. There are of course exceptions where work must be legitimately delayed.

The power company's joint line inspector follows up every case in which a pole is condemned by the line inspector. This applies regardless of which company may renew a joint pole. If a pole is not renewed by two months from the date of the pole inspector's report, he must bring this to the attention of the superintendent of distribution. Further, the representative is obliged to continue to report this at intervals of two months as above stated, until the pole is renewed. In especially dangerous cases it is required that such matters be reported every two weeks and then at

HAZARDOUS
SEMI-MONTHLY: RE-INSPECTION / ROUTINE — INDICATE BY CROSS TYPE OF INSPECTION

SHEET_____ OF_____

POLE INSPECTION REPORT

OPERATING COMPANY

CITY OR TOWN OF _____ PERIOD FROM _____ TO _____

DATE	NUMBER OF POLES INSPECTED: PRIVATE	SOLELY OWNED	JOINTLY OWNED	TOTAL	LOCATION STREET OR ROAD	NUMBER ZERO LIFE	NUMBER REQUIRING INSPECTION: NEXT YEAR	IN 2 YEARS	IN 5 YEARS
					CARRIED FORWARD				
					TOTALS				

REMARKS: LIST OF "0" LIFE POLES AND GUYS RECOMMENDED (SEPARATE SHEET MAY BE USED)

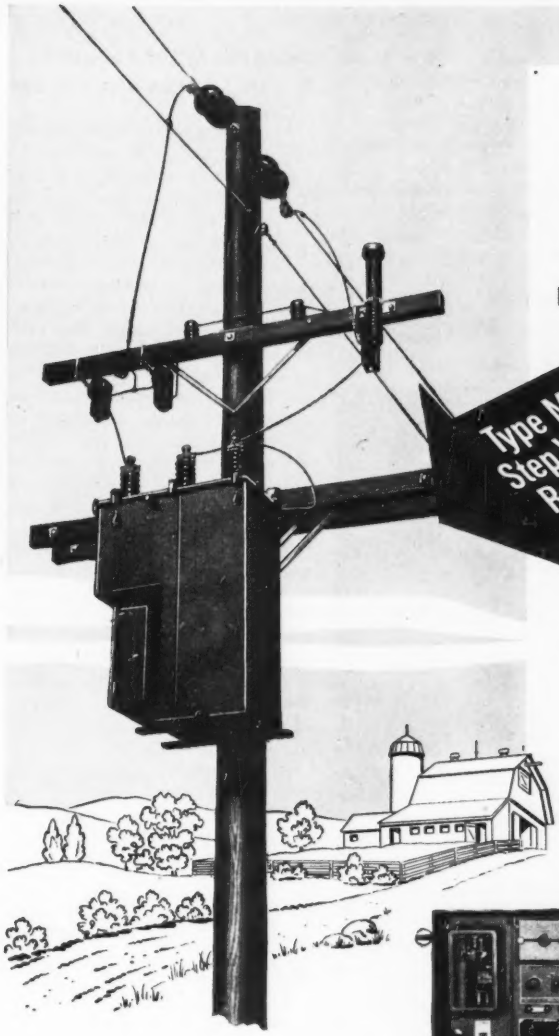
APPROVED: _____ POLE INSPECTOR

* USE SEPARATE SHEET FOR EACH TYPE. HAZARDOUS REFERS TO POLES IN HAZARDOUS AREA WHICH ARE INSPECTED FIRST EVERY YEAR. RE-INSPECTION REFERS TO POLES WITH LESS THAN FIVE YEARS ESTIMATED LIFE DUE FOR INSPECTION IN CURRENT YEAR, BUT WHICH ARE NOT IN THE AREA RECEIVING COMPLETE ROUTINE INSPECTION. ROUTINE INCLUDES POLES IN AN AREA SCHEDULED FOR COMPLETE ROUTINE INSPECTION FIVE YEAR POLES DUE FOR INSPECTION, AND POLES RECEIVING THEIR INITIAL INSPECTION

TYPICAL pole inspection report form (8½ x 11 in.) for "hazardous areas" (i.e., those where considerable numbers of persons congregate, as in schools, churches and other public buildings). Space is provided for data on number of poles inspected and location and number of poles requiring inspection immediately (zero life), as well as future inspection needs

* Concluding a five-article serial which began in ELECTRICAL WORLD, Nov. 20, 1948, page 110.

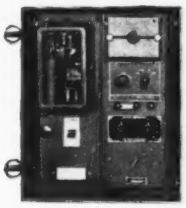
Here's the economical way to keep voltages right on rural lines



In rural service especially, voltage regulators provide the simplest, least expensive method for maintaining proper voltage to all consumers—for insuring more revenue and fewer complaints.

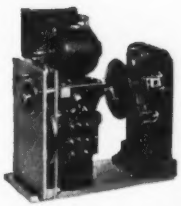
For a service-proved regulator, built specifically for rural lines, use General Electric's Type ML-4. It is a single-phase step-type regulator—provides ten per cent automatic voltage regulation at low cost, and with minimum maintenance.

Apparatus Dept., General Electric Company, Schenectady 5, New York.



DEPENDABLE, AUTOMATIC CONTROL—

Voltage regulating relay, motor control relay, and other elements of the control panel are similar to those in the more expensive type of induction regulator used at urban sub-stations and important load centers.

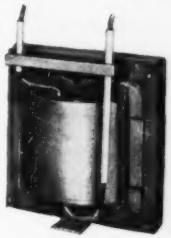


THE SWITCHING MECHANISM—

Shockless, snap-action, Geneva drive assures accurate positioning of contacts and long life. A tap change is completed in 1½ cycles. The complete mechanism operates under oil and requires no lubrication.

SPIRAKORE CORE AND COILS—

The regulating transformer used in the ML-4 step voltage regulator is of Spirakore design—similar to the famous G-E Spirakore distribution transformer, with the flux through the core following the grain direction of the steel, giving smaller size and lighter weight.



GENERAL ELECTRIC

404-58

weekly intervals until the pole is renewed.

Comprehensive routines are provided for reports by the joint line representative both semi-monthly and quarterly to the superintendent of distribution. Among the subjects covered are pole inspection data, ownership, life expirations, details of old and new poles handled, reasons for replacement, and a check-up of life estimates by foremen in charge of work. If the general line foreman of the company feels that an error has been made in life estimating, provision is made for a discussion of the estimate by the joint line representative, line inspector, general foreman and the superintendent of distribution, as may be required.

Rotating Sector for Scale Marking

ROTATING SECTOR beneath table at right is used by Montana Power Co to mark instrument scales on mounted, curved scale plates. As sector rotates, scale passes beneath square hole in table top with $\frac{1}{8}$-in. clearance. Special board and lettering guide at left are used for flat scales, either round or curved

E. W. WILLIAMS
Montana Power Co
Butte, Montana

RECALIBRATION OF indicating switchboard instruments may require new scales to be drawn on mounted curved scale plates. Montana Power Co has developed the device, shown above right, to facilitate this work.

A sector is mounted on a rotating shaft under a small table which has a square hole cut in the top. As the sector is rotated the scale passes beneath the hole about $\frac{1}{8}$ in. below the surface of the table. Main scale divisions or test points are drawn with a ruling pen and T-square. The scale can be moved any desired amount by means of a knurled knob and lever fastened to the end of the shaft.

Sub-divisions of the scale may be located by dividing main divisions into equal parts. Quick and easy division of varying distances into equal parts can be done graphically. The adjustable scale used is shown on top of the table. It is a piece of bond paper, creased every $\frac{1}{8}$ in., with five lines drawn from the base to the vertex of a triangle. By folding over the vertex until the width of the triangle equals the total distance across the scale, the intermediate points can be located.

The special drawing board shown on the left is used for unmounted scales. It is used for round scales for SM or SY type instruments, or curved scales for AR4, AR6, or AD type instruments. A special LeRoy lettering guide is used to make a figure similar to the standard for these instruments. The scale is secured to the brass plate with a rubber cement. A Fiberglas eraser is exceptionally good for erasing ink from scales or drawings if used lightly and brushed in only one direction.

Sulphate Mill Changes to Higher Distribution Voltage

MAJOR REVAMPING of the existing electrical distribution system was a part of the construction of Weyerhaeuser's new sulphate mill and the conversion of the sulphite mill to a magnesium oxide base.

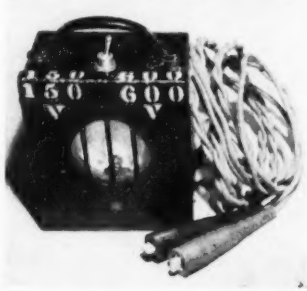
Power at 13,800 v is now transmitted to ten outdoor open substations convenient to the various load centers serving both mills. Here voltage is stepped down to 2,300, 550, 220 or 110 v as needed. The distribution line from power house to substations consists of aerial, self-supporting braided and insulated voltage cable. The new system is more efficient than the previous 2,300-v feeder system and permits flexible operation of various phases of the process.

The sawmill power station and the new power station at the pulp division are interconnected at 13,800 v and distribution is by high voltage feeders. Since sulphite recovery furnaces are located in the same building with the kraft recovery furnace, common power generating equipment is used to serve both the sulphite and kraft mills.

Steel Case Protects Instruments in the Field

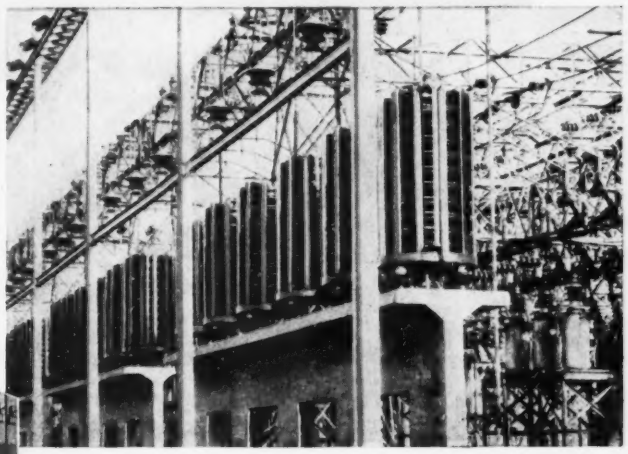
REPAIRS decreased 75% after Portland General Electric enclosed ammeters and voltmeters in special cases to withstand rough handling in the field. Also, the instrument remained accurate longer.

The protective steel case is spot-welded, completely lined with one in. thick felt, and $\frac{1}{4}$-in. steel bars protect plexiglas cover.

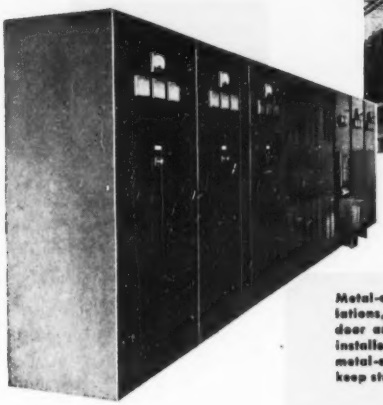


cast-in-concrete

Current-limiting Reactors
INDUSTRY'S FAVORITE FOR 35 YEARS



This 25-year-old installation has required practically no maintenance, has given no trouble. It consists of thirty-six 120-kva 3-phase 22,000-volt cast-in-concrete reactors, each giving a 3-per-cent reactive drop.



Metal-enclosed reactors can be matched to switchgear installations, and are becoming increasingly popular for both indoor and outdoor service. Here, three 3-phase reactors are installed between switchgear equipments. As with all G-E metal-enclosed reactors, the enclosure is specially designed to keep stray current — and electrical losses — to the minimum.

Nothing tops these cast-in-concrete reactors in mechanical or electrical strength, in resistance to weathering, or in long maintenance-free life. Conductors and concrete are a one-piece structure—with rock-like resistance to weathering and with the strength and rigidity to withstand short-circuit magnetic forces. Good clearances, elimination of through bolts, and crossovers made within the concrete supports give maximum protection against flashover. Special treatment during finishing processes renders them highly resistant to moisture.

Almost from the day they were introduced, 35 years ago, General Electric cast-in-concrete reactors have outsold all other current-limiting reactors by a substantial margin. And today—wherever you want a reactor to limit short-circuit current, to protect service on other parts of your system or reduce the current-interrupting duty of your breakers—they are still unbeatable.

Usual ratings range from 50 to 1500 amperes, and voltages up to 34,500. Details are given in publication GEA-976, *Apparatus Department, General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

401-56

The a-c secondary network system is recognized as *the* lowest-cost system for providing heavy load areas with the highest-quality service—both in voltage and in continuity. It is normally the most economical high-quality service system for business sections of cities having underground distribution, and of the order of 50,000 or more in population—and may often pay its way in smaller towns as well.

But—to realize the full savings possible with networks, you must use standardized network equipment. For example:

YOU SAVE ON INSTALLATION when you specify

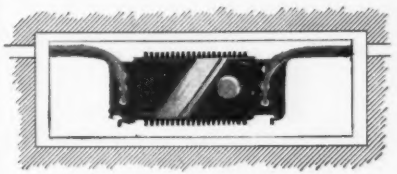
STANDARDIZED NETWORK EQUIPMENT

NARROWER VAULTS G-E standardized network equipments are designed for vaults with widths of only 4½ feet—or less. Such vaults can almost always be built between building line and curb—the best location from the standpoint of real estate, construction, and servicing. Such narrow vaults reduce appreciably the problem of roof-slab construction.

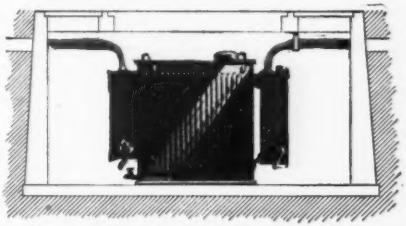
REASON: G-E standardized network equipments require servicing only from the two ends. The network protector is located on the low-voltage end—can be slid out on rails from its housing for ready inspection or adjustment. All transformer accessories, as well as the high-voltage switch, are located at the high-voltage end—liquid-level gages, thermometer, pressure test valves, tap changer, drain valves, sampling valves and filter press valves can all be inspected or operated from this end.

SHALLOWER VAULTS With G-E standardized network equipments, vaults can be as much as one or two feet shallower—saving substantially in excavating and construction costs. Vault drainage is also simplified—though either the vault type or the subway type transformer can be completely submerged without damage or interruption of service.

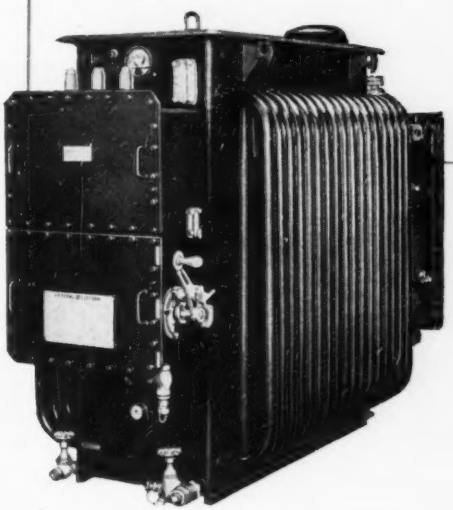
REASON: With G-E standardized network equipments, both high- and low-voltage cable terminals are well below the top of the transformer. Even in these shallow vaults there is room for large-radius bends of cables.



With manhole openings at both ends, vault need be only 14' long, 4½' wide for 500-kva transformers.



A clear depth of 7' below roof slab will provide sufficient room for maintenance and inspection.



PLUS

FASTER DELIVERY G-E standardized network transformers and protectors can be supplied on shorter delivery.

LOWER PRICE G-E standardized network units are appreciably lower in price than non-standard designs.

LESS MAINTENANCE G-E standardized network equipments incorporate all maintenance-saving developments which the industry recognizes as desirable—gaskets eliminated by welding cover and switch box to transformer, accessories grouped for maximum convenience, all bushings externally removable without opening the main transformer tank, dust-tight relays which can be easily removed for checking, and then replaced.

An inquiry to your G-E Representative or a letter to *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*, will bring you information on standardized network equipment—and just what should be specified to secure the savings which this equipment makes possible. Bulletin GEA-5024 describes standardized network transformers; GEA-2017 describes G-E network protectors.

GENERAL ELECTRIC

How to Determine Battery Charger Size For Industrial Trucks

Formulas are developed for calculating maximum motor-generator set or rectifier ratings for automatically charging lead-acid and nickel-iron-alkaline types of batteries. These formulas are also condensed into rule-of-thumb equations for approximate values. The data are adapted from a manual on materials handling by General Electric Co, Schenectady, N. Y.

Maximum Motor-Generator-Set Kilowatt and Horsepower Ratings for Battery Chargers For the Modified Constant-Voltage Charging System

Battery Size	6-hr Disch	1 Battery		2 Batteries		4 Batteries		8 Batteries		14 Batteries		32 Batteries	
	Amp-hr	kw	hp	kw	hp	kw	hp	kw	hp	kw	hp	kw	hp
Lead-Acid Type Battery													
16 Cell	200	1½	3	3	5	7½	15	15	25	20	30	50	75
16 Cell	400	3	5	7½	15	15	25	25	40	40	60	100	150
16 Cell	600	5	7½	10	15	20	30	40	60	60	100	150	250
18 Cell	200	2	3	5	7½	7½	15	15	25	25	40	60	100
18 Cell	400	5	7½	7½	15	15	25	30	50	50	75	125	200
18 Cell	600	5	7½	10	15	20	30	40	60	75	125	....	....
Nickel-Iron-Alkaline Type Battery													
30 Cell-A6	225	3	5	7½	15	15	25	25	40	40	60	100	150
30 Cell-A8	450	7½	15	15	25	25	40	50	75	100	150	....	....
30 Cell-D8	600	10	15	20	30	30	50	60	100	125	200	....	....

NOTE: The ratings shown in the above tables are calculated from Formulas No. 1 and No. 2. Ratings for other battery sizes can be obtained by use of these same formulas. The ratings tabulated or calculated from the formulas may be higher than commonly used. The application of a service factor depending on actual operating conditions may sometimes permit the use of the next lower standard kilowatt rating.

IN SELECTING the correct charging equipment, the following information must be known:

(1) Type of battery—whether lead-acid or nickel-iron-alkaline.

(2) Number of cells per battery.

(3) Manufacturer's ampere-hour rating or number and type of plates per cell.

(4) Manufacturer's type designation.

(5) Time available for charging (see Standard Charging Periods).

(6) Available a-c power-supply voltage, frequency, and phase.

The accompanying table gives the kilowatt requirements for a few sizes of batteries. The motor horsepower is given for the motor-generator sets. For batteries which these tables do not include, ratings may be calculated by formulas which are developed. They can be used to determine the maximum kilowatt rating of a motor-generator set, or the maximum amperes required for charging any number of uniform-sized batteries by the modified, constant voltage system.

1. Short formula for estimating charging equipment size for a lead-acid battery (8-hr charging period). Multiply the number of batteries times the ampere-hour capacity (6-hr discharge rating) of one battery, times the number of cells per battery. Divide the product by 2220. The result equals the approximate kilowatts. To determine the approximate amperes divide the calculated kilowatts by the number of cells and multiply by 380.

2. Rule for estimating charging equipment size for a nickel-iron-alkaline battery (7-hr charging period). Multiply the number of batteries times the number of cells in one of them, times the manufacturer's charging rate. Divide the product by 470. The result equals the approximate kilowatts. To obtain the approximate amperes, divide the kilowatts by the number of cells and multiply by 500.

Formulas for Calculating Maximum Ratings of Battery Chargers

1—Generator Volts:
Lead-Acid Batteries: V = Number of cells × 2.63*
Nickel-Iron-Alkaline: V = Number of cells × 2.00*

2—Generator Kilowatts:
Lead-Acid Kilowatts =

$$\frac{\text{Gen Volts} \times \text{No. Batteries} \times \dfrac{\text{Amp-hr}}{100} \times 22.5 \times 0.8}{1{,}000}$$

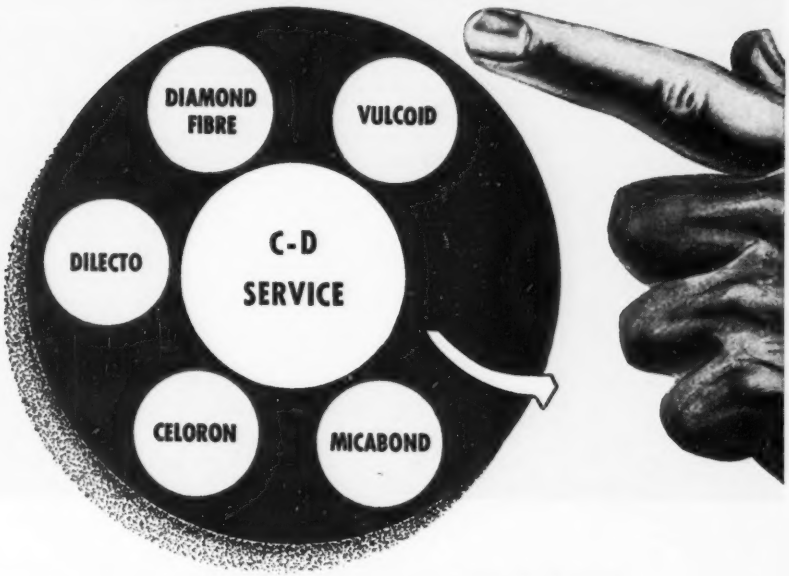
Nickel-Iron-Alkaline Kilowatts =

$$\frac{\text{Gen Volts} \times \text{No. Batteries} \times \text{Normal Charging Amp} \times 1.4 \times 0.8}{1{,}000}$$

Standard Charging Periods:
Lead-Acid Batteries 8 hr*
Nickel-Iron-Alkaline Batteries 7 hr*

* Recommended by the Electric Industrial Truck Association; for other values refer to E. I. T. A. Standard Specifications.

The right material for your job . . . right at your fingertips!



How to Save Production Hours and Dollars on Your Electrical Insulating Jobs . . .

One of the surest ways to reduce unit costs on any job is to be right the first time when selecting materials. Continental-Diamond's complete line of high strength electrical insulating materials makes proper product engineering easy.

There are trained C-D technicians on hand at all times to give you personal help in getting better, lower-cost applications. To be sure of being right the first time in the selection of materials, call your nearest C-D office whenever the need arises.

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What Tools Do Line Trucks Carry?

THE ACCOMPANYING LIST of 148 different tools and accessories carried on utility line trucks of the light, medium and heavy duty class was developed from a recent survey of the Motor Transportation Committee of the Pennsylvania Electric Association among eight member utilities. The majority of companies reported the same list of tools, but the quantity varied somewhat. The range is indicated together with the quantity tentatively recommended by the committee.

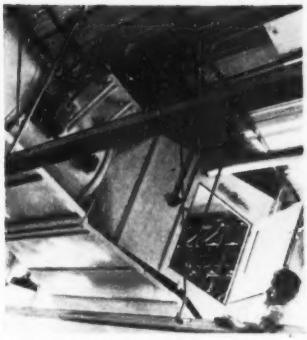
ELECTRIC WORLD will publish in its next issue a similar list of the construction materials normally carried by line trucks.

Item	Heavy			Medium			Light		
	Hi	Lo	Rec	Hi	Lo	Rec	Hi	Lo	Rec
First aid kit	1	1	1	1	1	1	1	1	1
Goggles	6	2	3	5	2	2	2	1	2
Woolen blankets	1	0	1	2	0	1	2	0	1
Rubber blankets	9	0	6	6	0	3	6	0	3
Hose—long line	36	12	18	36	4	18	30	2	6
Hose—short line	21	5	12	21	4	12	15	3	6
Insulatorhoods	20	6	12	20	4	8	12	0	6
Rubber sleeves (Pr)	6	0	3	5	0	3	2	0	2
Rubber gloves (Pr)	10	6	6	10	1	4	4	1	2
Hot line rubber jumpers	4	0	3	4	0	3	4	0	2
Rain coats	5	0	—	5	0	—	3	0	—
Rubber overshoes	0	0	—	6	0	—	6	0	—
Water cask	1	0	1	1	1	1	1	0	1
Pyrene fire extinguisher	1	0	1	0	0	1	0	0	1
Water bucket	2	0	—	1	0	—	0	0	—
1-gal can	2	0	—	0	0	—	0	0	—
Coffee pot	1	0	—	1	0	—	1	0	—
Red flags	4	2	4	6	2	4	6	2	4
Traffic Danger signs	4	2	2	4	2	2	4	2	2
Highway kerosene lamps	3	0	2	1	0	2	1	0	2
Flashlights	1	0	1	1	0	1	0	0	1
Broom	1	1	1	1	1	1	1	0	1
Small oil can	1	0	—	0	0	—	0	0	—
Truck chains	1	0	—	0	0	—	0	0	—
Tow bar	1	0	—	0	0	—	0	0	—
18-in. wood wheel block (truck)	2	0	—	0	0	—	0	0	—
Testor	1	0	1	1	0	1	1	0	1
Rotator	0	0	—	1	0	—	1	0	—
4-kv Phasing set	1	0	—	1	0	—	0	0	—
Voltmeter	0	0	—	1	0	—	1	0	—
Set of lineman's tools	4	0	3	4	3	3	4	2	2
Canvas tool bag	4	0	4	5	2	4	5	2	3
Wood chisels	3	2	3	3	2	2	2	1	2
Hand chisels	4	1	2	4	1	2	2	1	1
Center punch	1	0	—	0	0	—	0	0	—
4-in. vise	1	0	1	1	0	1	1	0	1
Level	1	0	1	1	0	1	1	0	1
Square	1	0	1	1	0	1	1	0	1
T-square	1	0	—	0	0	—	0	0	—
100-ft tape	1	0	1	1	1	1	1	1	1
Wire gage	1	0	—	0	0	—	0	0	—
100-lb scale	1	0	—	0	0	—	0	0	—
Blow torch	0	0	—	0	0	—	1	0	—
Soldering furnace etc.	1	0	—	1	0	—	1	0	—
Crescent wrench	6	0	3	6	1	3	6	1	2
Pipe wrench	2	1	2	2	1	2	2	0	1
Monkey wrench	2	0	1	0	0	—	0	0	—
High tension ratchet wrench	2	0	1	2	0	1	1	0	1
Truck wrench set	1	0	—	0	0	—	0	0	—
Socket wrench set	1	0	1	1	0	1	1	0	1
Assorted wrenches	5	0	—	0	0	—	0	0	—
Bolt cutters	3	0	2	3	0	2	3	0	1
Insulated bolt cutters	3	0	1	3	0	1	2	0	1
Hot line cutters	0	0	—	1	0	—	1	0	—
Draw knife	1	0	—	0	0	—	0	0	—
Nicropress tool	1	0	1	0	0	—	0	0	—
Sleeve connecting tool	2	0	2	2	1	2	2	1	1
Armor rod twisters	0	0	—	2	0	—	1	0	—
Mechanical hand	0	0	—	1	0	—	1	0	—
Bolt taps & dies	0	0	—	1	0	—	1	0	—
Braces	6	0	3	6	2	2	2	1	1
Wood bits 11/16 in.—long	6	2	3	6	3	3	6	0	2
Wood bits 11/16 in.—short	4	0	4	3	0	2	3	0	2
Wood bits 7/8 in.—short	2	0	1	2	0	1	1	0	1
Wood bits 13/16 in.—long	4	0	1	0	0	—	0	0	—
Wood bits 5/8 in.—short	2	0	1	2	0	1	2	0	1
Wood bits 9/16 in.—short	3	0	3	2	0	—	1	0	—
Wood bits 1/2 in.—long	4	0	2	4	0	2	1	0	2
Wood bits 7/16 in.—short	6	0	2	2	0	2	2	1	1
Brick Drills	3	0	2	4	0	2	4	0	2
Short drills bars	4	0	2	4	0	1	3	0	1
Assorted rawl plug drills	8	0	—	0	0	—	0	0	—
Screw drivers	5	3	4	5	2	3	5	1	2
Reflec button bit, hammer	1	0	—	0	0	—	0	0	—
Staple puller	1	0	—	0	0	—	0	0	—

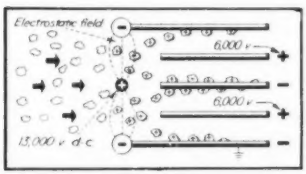
Item	Heavy			Medium			Light		
	Hi	Lo	Rec	Hi	Lo	Rec	Hi	Lo	Rec
Pole number plate bit	1	0	—	0	0	—	0	0	—
Files	4	2	4	5	3	4	5	2	4
Hack saws	2	1	2	2	1	2	1	1	1
Hack saw blades	12	12	12	12	12	12	12	12	12
Cross cut saw	1	0	1	2	0	1	2	0	1
Tree saw	1	0	1	2	0	1	2	0	1
Hand saw	3	2	2	3	0	2	2	1	2
Tree Trimmer	1	1	1	2	1	1	1	1	1
Axe	2	1	2	2	0	1	2	1	1
Sledge	2	1	2	2	1	1	2	0	1
3-lb hammer	6	2	5	6	4	5	4	2	3
Long handle shovel	6	0	3	6	0	3	5	0	3
5-ft shovel	6	0	5	6	2	4	5	0	3
Pick	1	1	1	1	1	1	1	0	1
Brush hook	0	0	—	3	0	—	3	0	—
10-in. steel wedges	2	0	—	0	0	—	0	0	—
Rack jumpers	0	0	—	2	0	—	2	0	—
Switchstick	2	0	2	4	0	2	4	1	1
Hot line clamp stick	8	0	2	0	0	2	6	0	2
Tie-in stick	1	0	1	2	0	2	1	0	1
Hot line push stick	0	0	—	1	0	—	1	0	—
Guy wire make-up stick	2	0	—	0	0	—	0	0	—
Pike pole	6	4	6	6	4	6	6	0	4
8-ft mule	0	0	—	2	0	—	2	0	—
Cant hook	2	2	2	3	2	2	2	0	2
Spoon	6	2	5	6	3	4	3	0	2
Tamper	3	2	2	3	2	2	3	0	2
Steel bar	7	0	6	6	2	5	5	0	4
Paddle bar	0	0	—	1	0	—	0	0	—
Bull points	5	0	—	4	0	—	4	0	—
Anchor digger	2	0	—	1	0	—	1	0	—
Pole derrick	1	0	1	1	1	1	1	0	1
Coffing hoist	3	0	9	3	1	2	2	0	2
Coffing guy clamps	2	0	—	2	0	—	1	0	—
Pole jack & chain plate	1	0	1	1	1	1	1	0	1
Pole puller plate	0	0	—	2	0	—	2	0	—
Pole binder	2	0	—	1	0	—	0	0	—
Extension ladder	1	1	1	1	1	1	1	1	1
Tree hook	1	0	—	0	0	—	0	0	—
Transformer gin	0	0	—	1	0	—	1	0	—
Standing board	1	0	—	1	0	—	1	0	—
Dividing board	1	0	—	0	0	—	0	0	—
Safety platform	0	0	—	1	0	—	1	0	—
Jack strap	0	0	—	2	0	—	2	0	—
Haven clamps & Come-along grips	12	4	12	15	12	12	12	4	8
6-in. blocks	0	0	—	1	0	—	1	0	—
5-in. blocks	2	0	—	2	0	2	2	0	1
4-in. blocks	4	0	2	4	0	2	3	0	2
1/2-in. blocks, 2 sets	2	0	—	2	0	—	1	0	—
3/4-in. blocks, 2 sets	2	0	—	2	0	—	1	0	—
10-in. snatch blocks	3	0	—	0	0	—	0	0	—
8-in. snatch blocks	3	0	2	3	0	—	3	0	—
6-in. snatch blocks	4	0	3	4	2	3	3	0	3
1/2-in. hand line	9	0	8	6	4	6	6	2	4
1/2-in. sling	10	1	6	6	0	6	6	0	6
3/4-in. sling	9	0	6	8	0	6	8	0	2
1-in. sling	0	0	—	9	0	—	9	0	—
1/4-in. rope (100 ft)	0	0	—	3	0	3.5	2.5	0	2
3/8-in. rope (100 ft)	2	0	1	0	0	—	0	0	—
1/2-in. rope (100 ft)	12	0	2.5	12	0	2.50	5	0	2
200 ft—1 in. bull line	1	0	—	0	0	—	0	0	—
200 ft—3/4 in. bull line	3	0	—	0	0	—	0	0	—
100 ft—3/8 in. rope with blocks	2	0	1	0	0	—	0	0	—
250 ft—1/2 in. rope with blocks	2	0		0	0	—	0	0	—
300 ft—1/2 in. rope with blocks	3	0	1	0	0	—	0	0	—
150 ft—1/2 in. rope with blocks	2	0	—	0	0	—	0	0	—
Hot line boom	0	0	—	1	0	—	1	0	—
Hot line rope (ft)	0	0	—	75	0	—	75	0	—
3/8-in log chain(12or14ft.)	6	0	3	3	2	3	3	0	3
Pole cart safety chain	2	0	2	2	0	2	2	0	2
Collapsiable reel	1	0	—	1	0	—	1	0	—
Winch head	1	0	1	1	0	1	1	0	1
Winch hook	1	0	—	0	0	—	0	0	—

Electrostatic Air Cleaning In Textile Mills

C. H. McWHIRTER
Precipitation Engineer
and
R. P. POSEY
Industrial Engineer
Westinghouse Electric Corp
Atlanta, Ga.



ELECTROSTATIC AIR CLEANER installed in individual type, forced air system



POSITIVE CHARGE is placed on surface of the dirt particle; then the particle is drawn out of the air stream by being attracted to the negatively charged plates

FOR HIGH QUALITY of finished product many textile mills use electrostatically cleaned air. Contact of the yarn or cloth with contaminated surfaces produces dirt-smears that may be difficult or impossible to remove, resulting in an inferior product. For example, a few years ago a southern textile mill produced one million yards of rayon-filled crepe, satin, and voile per month with a spoilage of 168,000 yd. After installing electrostatic air cleaners, the maximum spoilage dropped to 50,600 yd per month, an increase of 12% in top quality production.

The drying of yarn frequently involves the direct passage of heated air through the yarn package. The package itself acts as a filter and retains any dirt in this air. A similar application is where skeins or packages of yarn are placed in an enclosure and dried by hot air.

To obtain best results, both make-up and recirculated air should be cleaned. Large quantities of dirt are brought into the mill on operators' clothing, shoes and hand trucks. In addition, high speed machines usually throw off an oil mist which contaminates the surrounding air. Only cleaning of the recirculated air can remove such contamination. Analysis of the conditions and product should be made to determine whether to clean all or only the make-up air.

Air Pressure Control

Infiltration of contaminated air can be prevented by sealing the room and providing a positive static pressure. Excess air escapes through relief dampers.

The most difficult problem in textile application of electrostatic air cleaners is that of lint removal, particularly in cotton and woolen mills. Unfortunately, the lint filaments tend to align themselves perpendicular to the charged plates. This may cause intermittant electrical breakdown and arcing between the plates. Increased arc-over rate reduces the efficiency of operation. When an extreme arc-over rate is encountered, damage to the equipment may result.

Preventive Measure

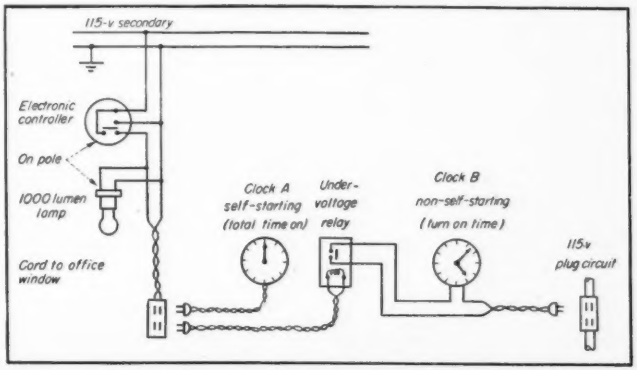
Arc-over rates can be reduced 10 to 50 times merely by the use of a 16 to 20 mesh screen ahead of the electrostatic cleaner. But usually arc-overs cannot be completely prevented. An average rate of one arc-over every two min is not excessive for the usual large installation.

When lint is removed by air washers, water must be kept out of the electrostatic air cleaner. Water droplets cause excessive arcing, corrosion, ionizing wire breakage, and other damage.

From a paper presented at AIEE Southern District meeting, Birmingham, Ala.

Clock Connections for Checking Relay Operation

IN TESTING electronic relays for street light control, an eastern power company utilized two electric clocks for getting time values. From a controller mounted on a pole outside the office of the company, a twisted 2-wire cord was run to a duplex outlet inside the building, with clock connections as illustrated. Clock *A* is set at noon daily after noting its reading, which is the total time the street light has operated since the



WIRING DIAGRAM for obtaining electric clock records of performance of electronic street light controls. Operation of controller determined by degree of daylight prevailing

FINAL ASSEMBLY AND TESTING

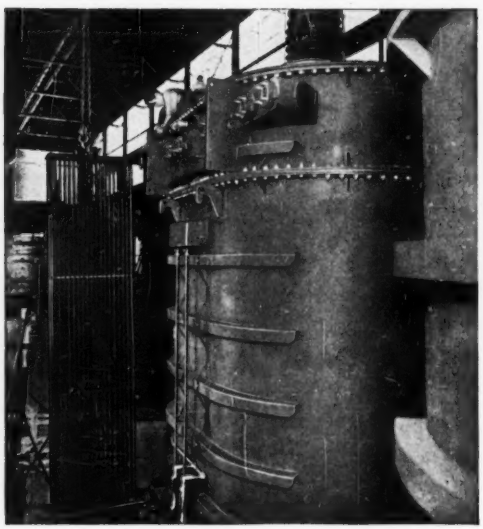
ANOTHER IMPORTANT PHASE IN THE MANUFACTURE OF

Power transformers represent a sizable investment for the purchaser, and he rightly expects them to provide many years of trouble-free service under average operating conditions. Of equal importance to him is the requirement of service continuity from a customer relationship standpoint. With these points in mind, the meticulous care that is exercised all through the earlier stages of production is not relaxed a bit during the final assembling and testing of Moloney Power Transformers. Close supervision and rigid inspection provide added assurance that the performance of the transformer in the field will measure up to the usual high Moloney standard.

MOLONEY ELECTRIC CO.

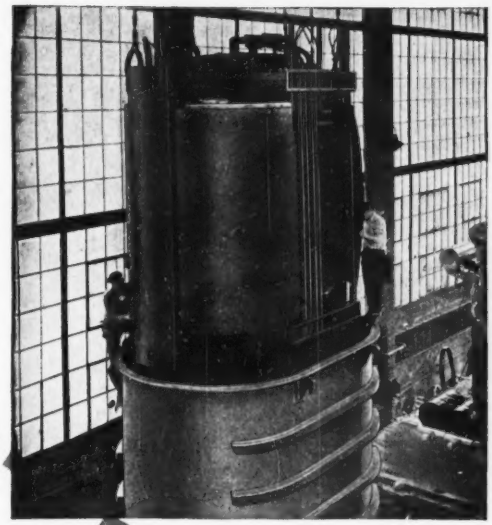
Power and Distribution Transformers Exclusively Since 1896

FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA

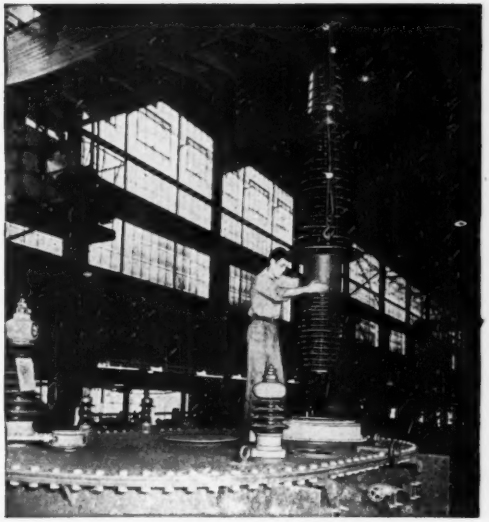


On small power transformers, the extra radiating surface necessary for dissipating the heat generated by the core and copper loss, is obtained by means of tubes or radiators welded directly to the tank wall. On larger power transformers extra radiation is provided by means of detachable radiators. Photo shows detachable type radiator being installed.

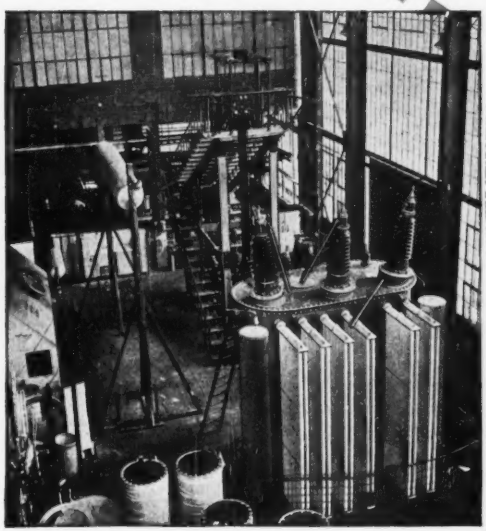
After the transformer has been completely assembled, it is thoroughly tested for possible leaks. In addition, the larger, high voltage transformer tanks are tested for ability to withstand *full vacuum* such as might be encountered in vacuum drying a transformer in its own tank in the field. Following this, standard electrical tests are made to assure performance in accordance with the guarantees.



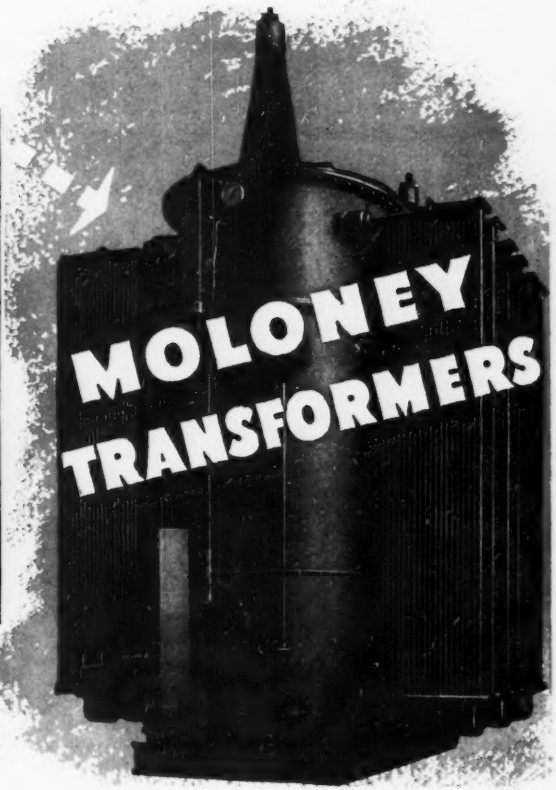
Following drying in a vacuum tank, the core-and-coil assembly is placed in its own tank, under oil. Channel guides provided on the inside of the tank to facilitate this operation, make it simple for the purchaser to remove the core-and-coil assembly for inspection, if desired.



After the core-and-coil assembly has been tanked and anchored securely in place, the tank cover is bolted or welded into position. The bushings are then installed. Photo shows a 115 Kv oil-filled bushing being lowered into position.



Frequently, purchasers specify that their transformers be impulse tested. This test is performed in the Moloney Surge Laboratory located at one end of the Power Transformer Assembly Department. Impulse tests, especially steep front-of-wave tests, simulate lightning conditions and are the most severe that can be imposed upon a transformer. The results of these tests are recorded on film by means of a cathode ray oscillograph.



previous setting. Clock *B* is set at correct Eastern Standard Time and started each day. When the street lamp is automatically turned on by the "electric eye" control (operated by degree of diminished daylight prevailing), the undervoltage relay opens, and Clock *B* stops, the reading being turn-on time. If the turn-off time is desired, it can be calculated from the two clock readings.

On week-ends or holidays, when the clocks are not set, the average daily time is obtained by dividing the total time on Clock *A* (adding as many 12-hr periods as required) by the number of elapsed days. Clock *B* gives time on for the first day only.

How to Indentify Poles

SYSTEMATIC METHODS of pole marking facilitates distribution work for the Central Maine Power Co. Property tags and pole numbers are always on the road side of the pole. Numbering is progressively away from the power source wherever feasible. Tags and numbers are placed six feet from the ground. On private property, markers are placed on the side facing the power source.

On jointly used poles, where CMPCo and NET&TCo (New England Telephone) numbers are the same, only one number is used. This is placed one inch below the property tag of the owner company. When such a pole bears different NET&TCo and CMPCo numbers, markers for CMPCo owned poles are placed 12 in. above telephone numbers. On poles owned by the telephone company the markers are placed 12 in. below telephone numbers (shown in Fig 2).

A joint-use pole bears only the property tag of the owner. The CMPCo applies its own numbers where such numbers are not the same as the telephone company's. Jointly owned poles bear the property tags and numbers of both companies. The number of the maintaining company is placed uppermost. CMPCo numbers and joint numbers on jointly used poles bear the prefix letter "J".

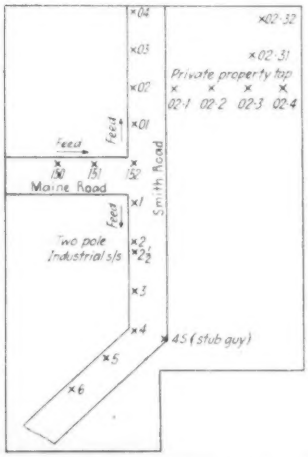


FIG 1—POLE NUMBERING on main and branch line utilizes decimal sequence

Numbering Branch Line Poles

On private property, branch lines of less than 10 poles are generally numbered serially beginning with No. 1. Each number is prefixed with a decimal point and number of the main line pole from which the branch is fed (Fig 1). Thus No. 02.3 indicates the third pole of the branch fed from main line pole No. 02. The decimal point is made with a half-inch period or a half-inch letter "O" placed halfway between the top and bottom of the figures between which it is used, rather than in its usual position. When extensions are made to such branches which bring the continuous number of poles to 10 or more, the prefix number and decimal point are removed, leaving the serial numbers only. Such branches are then given a map name for location identification. The suffix letter "S" is used with the number on guy stubs and push braces, the number used being that of the pole so supported.

Method Not Always Valid

Pole numbers are not regarded as always indicating the direction of feed. Wherever possible such numbers are applied away from the power source, but this is not invariably followed, especially in congested areas. As a safety precaution the number sequence is never regarded as an indication of direction of feed when killing line sections on which work is to be done.

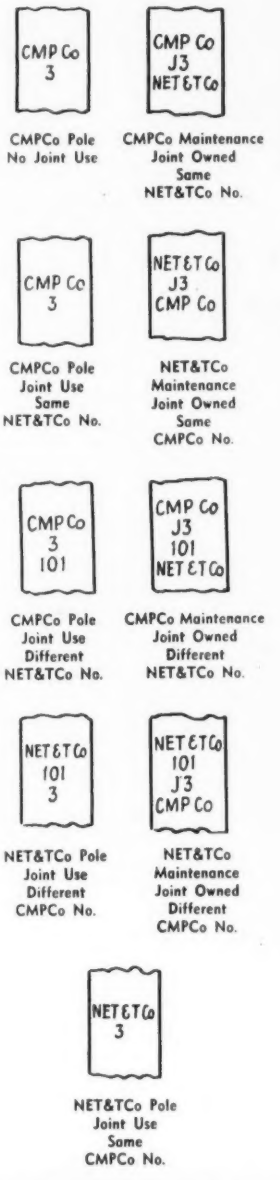


FIG 2—METHOD OF MARKING poles indicates individual and joint use and ownership, and responsibility of maintenance

HI-TENSION NEWS *Junior*

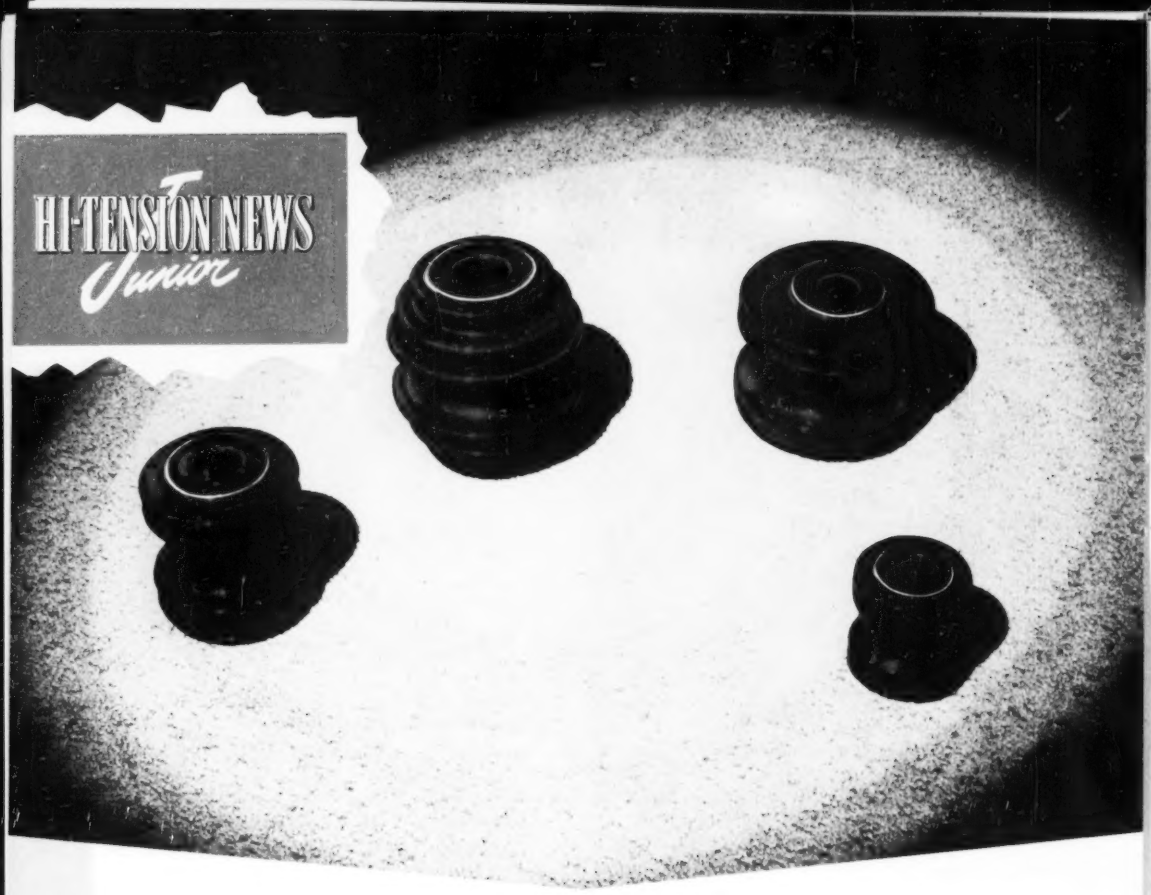
ANOTHER EXTENSION . . . of O-B Insulator Satisfaction

This is more than the extension of a line—it is an extension of over 20 years' previous fine performance of O-B suspension insulators!

Since 1927, when the original 94-mile circuit was built, O-B insulators have operated without needing any attention. This complete freedom from trouble guided the choice of insulators for the new 45-mile addition. And, O-B insulators are now specified on another 100-mile line being built by the same power company.

Of all reasons for continuing with O-B insulation, past experience is the best. And, with a generation of first-hand information as a guide, this company continues to choose O-B for its major porcelain insulation requirements. Follow this experience in making your own choice of insulators.

Section of original line built in 1927 with O-B suspension insulators, and operating today at 132 kv with the same insulator reliability as when new.



TWICE AS GOOD . . . without a price premium!

Spools aren't all alike! O-B spools have some real distinctions. They are made of wet process electrical porcelain; approximately twice the mechanical and electrical strength of common spools, and totally non-absorbent to moisture, the enemy of any insulation. They are hand-turned and finished. There are no mold ridges to cut cable sheaths. They are true to shape. Flare in the hole is accurately produced so that deflection of the bolt under load will not shatter the porcelain. On the subject of economy, an O-B wet process spool of two-inch size will exceed both the mechanical and electrical performance of the common three-inch type.

Finally, you can buy these superior spools at no price premium over ordinary kinds. And you can get them immediately, either from O-B stocks or from your local Graybar warehouse.

Thousands of potential trouble points can be protected by standardizing on the use of O-B wet process porcelain spools. Size-for-size, they're twice as good. Size-for-size, they cost no more.

BUILD BOTH GOOD LINES and GOOD WILL WITH O-B SILENTYPES

★ Look for the symbol "ST," standing for Silentype, under the glaze of your O-B pintype insulators. It tells you that, for only a few cents extra, no radio interference complaints will ever be caused by that insulator—an insignificant price to pay for a reduction of trouble calls and improved public relations.

Through the use of a semi-conductive glaze, areas of electrical over-stress are eliminated. At normal operating potential, radio influence voltages are below objectionable levels. No electrical or mechanical values are sacrificed. Silentype performance is merely added to the regular characteristics of the insulator.

When you install O-B Silentypes you are assured of the lowest rate of insulator depreciation, plus improved public good will. Specify these insulators on all future pintype construction.

● Somewhere, occasionally, a guy strain insulator must withstand full conductor potential. Since we don't know where or when, we must assume it in every case. A guy strain that has developed a crack under load, or that has become conductive from moisture absorbtion won't measure up to this emergency.

O-B guy strains are made of the same fine electrical wet process porcelain as the largest high voltage insulator. Compared to common molded porcelain, they will develop approximately twice the strength and withstand twice the voltage. They can never become conductive from moisture absorbtion.

With only four sizes of O-B guy strains, the full range of published standards can be met —likewise every normal construction requirement. These are available for immediate delivery, direct from O-B or from the Graybar Electric Company.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-LITE
HI-TENSION NEWS
Junior
(1) Approximate spiral on which the Hi-Lite clamp principle is based. (2) The spiral is cut apart, and (3) alternate sections are inverted to fall into a straight line. (4) These sections are joined up into a harmonic wave which imparts a spiral snubbing action to a linear zone of cable anchorage.

Like a Vise with Kid Glove Jaws!

This would be quite a job, but if you were to cut the seat of an O-B Hi-Lite strain clamp into small sections, turn alternate pieces around, and join them again, you would end up with a spiral. The accompanying drawing explains this with less trouble.

A spiral exerts an unusually high mechanical advantage in the act of snubbing. By using a spiral seat, the O-B Hi-Lite clamp snubs the conductor and thus produces great holding power without a damaging crushing action. In this way cable strength is not weakened. The O-B Hi-Lite clamp will develop over 90 percent of the conductor's ultimate without slip. Its holding power is best described as, "Like A Vise With Kid-Glove Jaws."

Through the use of this clamp, with a little ingenuity in a few possible cases, the conductor may be looped to form continuous jumpers, thus eliminating the problems of bolted connections in the power circuit.

Ingenious design that preserves the cable, plus the great advantage of an unbroken conductor at jumper points, add up to a powerful reason for your serious consideration of O-B Hi-Lite strain clamps. Specify these clamps in your future transmission hardware requirements.

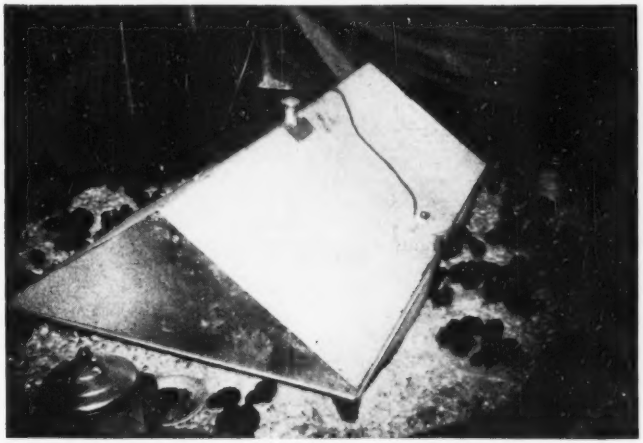
Ohio Brass

MANSFIELD, OHIO, U.S.A.

2968-H

LOAD BUILDING

Electric Brooding Aids Turkey Farming



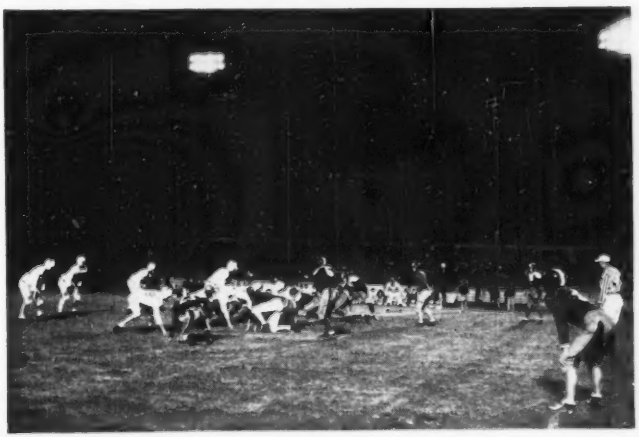
TYPICAL 750-w turkey brooder on Bay State farm ten handles up to 360 poults

Better quality of birds, easier operation and controlled humidity are provided through the use of electric brooders on the Dirks Turkey Farm, Palmer, Mass. Five 750-w brooders of the fan type were installed last spring. In a 36-day brooding period 600 poults and 400 chicks were handled. Energy consumption totaled 1,900 kwhr. Average cost of this energy was 2.15c per kwhr. Average use of energy was 1.9 kwhr. per bird. The average cost of brooding per bird came to 4.1c.

However, this high cost resulted because the full capacity of the brooders had not been utilized. The mortality rate was about half that of brooding under oil heat, which requires five gal per day with 300 birds. Electric brooding means better feathers and dry litter. Electric fan power was about 1/12 hp per brooder.

In planning for future work, it was figured that 1,800 birds could be cared for with five electric brooders. The energy consumption of about 1.06 kwhr per bird would be practically half the original rate. This would represent a cost of 2.27¢ per bird. Next spring it is expected to use a higher production load per brooder than was first used as noted above. Energy is supplied to this relatively small turkey ranch by the Central Massachusetts Electric Co, with headquarters at Palmer, Mass. The normal brooding period is in April and May.

Sports Floodlighting in California



ARTIFICIAL LIGHTING for playgrounds, football, baseball and softball fields has gained wide acceptance in northern California since the war. Development of efficient, easy-to-use floodlights suitable for a wide variety of applications and conditions has made this possible. No longer does expense of a satisfactory installation restrict night lighting to larger fields.

(*Continued on page* 128)

FOOTBALL FIELD, of Mt. Diablo Union High School, is one of many in northern California floodlighted since the war. Development of efficient, simple and inexpensive floodlights has brought lighting costs within reason for small football, baseball and softball fields as well as many playgrounds in this area. Eighteen installations requiring 1,566 lamps were made in the past year

As an example, 18 installations of General Electric's L-69 lights have been installed in northern California during the past year. Total cost of installation for 1,566 of the 1,500-w units was approximately $275,000, or an average of about $15,200 per job.

Methods of financing the installation were many and varied. Money was raised in some cases by public subscription, by large donations as memorials, by citizens committees, or directly by a school board. One community of 800 people raised $10,000 selling non-interest-bearing bonds to be redeemed by chance drawings. To pay off the bonds, 25% of the gross receipts will be used.

Dog Hotel Has Electric Heat

NOT HOT DOGS, NOR COLD, but canines in comfort at just the right temperature are those boarding at Walker's Hotel for Pets, San Diego, Cal. These dogs enjoy electric radiant heating.

Owner Paul T. Walker installed standard heating cable about 3 in. under concrete. He laid the cable on the original concrete floor, covered it with compound to protect the lead, spread a topping of sand, then poured a new concrete floor.

The cost of the cable was 10¢ per ft. It was looped so that 12 ft of cable heats one section which contains ten separate units for dogs. The kennel has four such sections. Operating cost for heating is estimated at 25¢ a day per section, at the commercial rate of 1¢ per kwhr. The system is thermostatically controlled and maintains a temperature of 60 deg.

Walker considers the operating cost about the same as for oil heat, but finds electric heat permits other economies. For instance, the new heating system eliminates the need for straw to keep the pets warm. That means the kennels can be hosed down each day more quickly than when straw must be handled.

Walker claims that such operating economies are relatively unimportant—the primary value is comfort appeal. Dog owners are impressed by the fact that their pets enjoy radiant heat, he says, and this builds business. The thermostatic controlled temperature of 60 deg also is desirable, since higher temperatures are considered harmful to a dog's coat.

Lots of Work for Home Service Advisers

THAT there is plenty of resultful work to be done these days by home service advisers is evidenced by the accompanying data on activities of Georgia Power Co. The figures are taken from the "Sales Log," publication of the company for circulation in its sales department.

	August 1948	9 Months 1948
Number of Employees (Average including supervisors)	40	42
Home Calls:		
Home Call Days	583.5	4,697.5
Number of Calls	3,585	28,485
Average Number of Calls per Day	6.1	6.0
Insts. Given on New Appliances:		
—for Dealer	1,122	9,183
—for Company	1,063	6,810
Insts. Given on Old Appliances	1,533	11,228
Total Appliance Demonstrations	3,718	27,221
Repairs Made	405	3,213
Repair Orders Made	297	1,855
Information Given on:		
Fuse Renewals	1,108	8,639
Lighting	2,183	17,375
House Wiring	1,287	10,032
Kitchen and/or Lndy. Planning	2,136	16,004
Rates	748	5,886
Food Preservation	1,648	10,805
Plans Presented on—House Wiring	43	425
—Planned Kitchen	207	1,735
—Planned Laundry	22	171
Kw of Lighting Load Added	83.7	625.1
No. Elec. Equip. Prospts. Developed	815	5,569
No. Elec. Equip. Sales Orders Taken	354	2,769
School Home Economics Depts.		
Survey Calls		55
Lecture Demonstrations		
Total Number Made	21	435
Lighting	3	92
Wiring, Kth. and/or Lndy. Planning	2	133
Cooking Schools, Appl. Dems.	15	175
Other	1	35
Total Attendance	1,152	22,025
Total Number Contacts	4,737	50,565

Still Going Strong

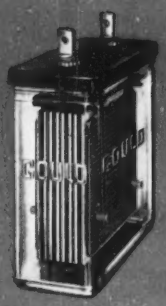
GEORGIA POWER'S CAMPAIGN to improve the home towns of Georgia folks is plugging right along and getting results, as is evidenced by the above announcement recently published in the daily and weekly newspapers of the state

Only GOULD Has It!

A modern research laboratory with pilot manufacturing plant where advance-design batteries are constantly created—and proved before production.

Gould uses the Metallomeen to photograph high magnifications of the structure of cast lead connectors, posts and grid frames.

The Metallomeen, a combination high-powered microscope and camera, is helping Gould scientists find the answers to age-old lead casting problems. With it, the complex crystalline structure of lead castings has become an open book. As a result, information rapidly becoming available points the way to even stronger, electrically more efficient grid frames, posts, straps and connectors. For better batteries always, choose GOULD—FOR FIFTY YEARS THE CHOICE OF ENGINEERS.



Gould Plants—
The Aristocrat of Stationary Batteries!

GOULD

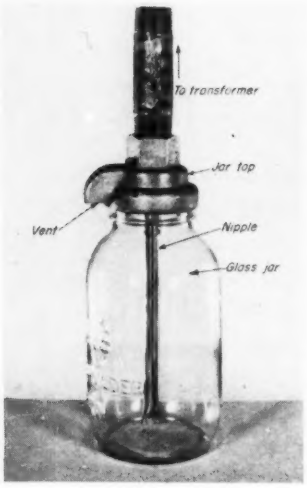
STORAGE BATTERY CORPORATION

Including the Storage Battery Division of Philco Corporation

TRENTON 7, NEW JERSEY

Always Use Gould Automobile and Truck Batteries

NEW EQUIPMENT



Transformer Breather

AN INEXPENSIVE silica-gel type vented breather for power transformers has been introduced recently by the Bradley Co, Inc, 101 N. 33 St. Philadelphia 4. Pa. The device is said to remove the moisture from air entering transformers as they "breath" under the influence of load fluctuations or changes in ambient temperature.

The breather consists of a cast bronze vented jar top, a slotted brass nipple and a standard 2-qt glass jar (not furnished). The jar is filled with silica-gel crystals. The assembly is said to provide dry intake air to the transformer by passing it around the crystals. Periodic replacement of the crystals is necessary.

•

Fluorescent Fixture

TO MEET the need for a fluorescent fixture where surface-mounting is required or desired, Leader Electric Co. 3500 N. Kedzie Ave. Chicago 18, Ill., has created the Surface-Mounted unit, for two, three or four 40-w lamps, which can be used singly or in continuous rows.

Features of the fixture include a curved-type Controlens that provides a diffused light; a reflector (the upper member) that works with lens and reflector to eliminate ceiling shadows and to light up ceilings. The bulk of the illumination, however, is downward.

•

Grease-Testing Equipment

FOR TESTING ball-bearing grease under simulated motor field conditions, General Electric Co's Special Products Division has announced test equipment which consists of a grease tester and control box.

Driven by a small motor, the tester has two bearings—one for testing; another for a guide. A 500-w heater between the bearings simulates the source and flow-paths of heat. A pair of copper-copnic thermocouples measure the temperatures of the outer bearing races.

The control box houses two thermostats, a motor switch, an actuation button and a time meter graduated in tenths of hours.

Additional information is given in Bulletin GEC-316, available at the General Electric Co, Schenectady 5, N. Y.

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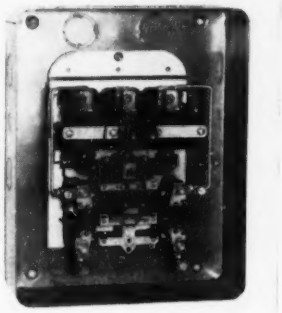
Solenoid-Operated Starters

INTENDED for applications where across-the-line, non-reversing starting of polyphase squirrel cage induction motors and single-phase motors is permissable. Bulletin 4113 Size 3 magnetic starters have been developed by Ward Leonard Electric Co, Mount Vernon, N. Y.

Starters are available with open type construction for built-in or specialized controls, or with NEMA Type 1 General Purpose Enclosures. They can be controlled by separate pilot devices or can be supplied with local control push-buttons or selector switches.

These magnetic starters have a maximum enclosed rating of 50 hp, 440-550 v, 3 phase, 60 cycles. Standard operating coils can be supplied for 110, 208-220, 440 and 550 v, 25 or 50-60 cycles. Dual voltage coils can be furnished for 110/220 or 220/440-v, 60-cycle operation.



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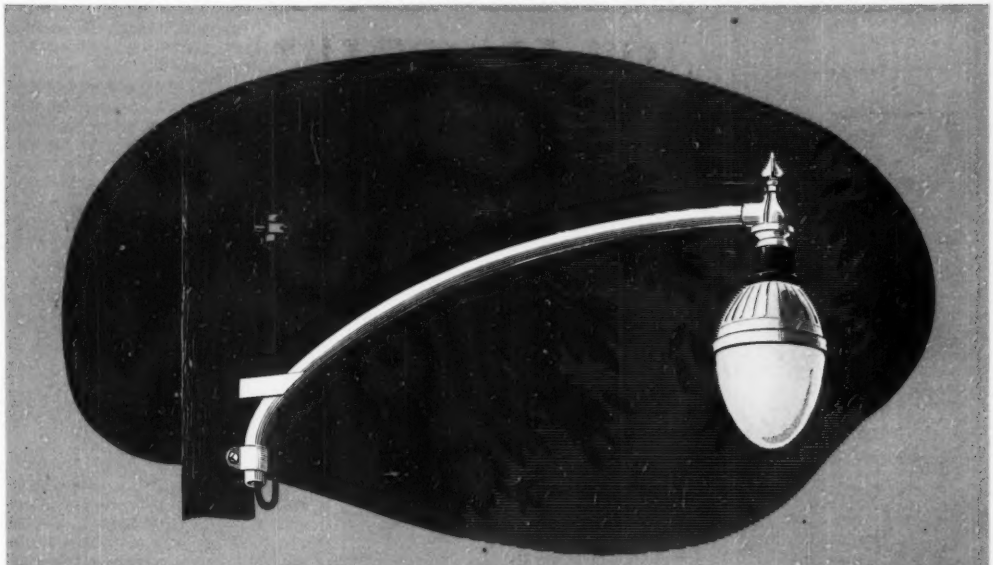
Extension Light

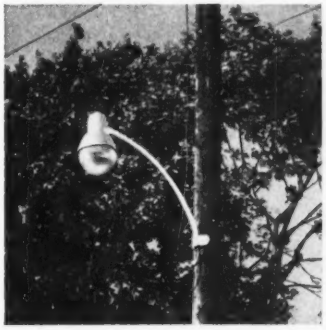
AN EXTENSION hand light with all surfaces of non-metallic materials, stated to be safe when used in high voltage work or submerged in salt water, is manufactured by Neoline, Inc, 124 W. 4th St, Los Angeles 13, Cal.

Features of this light, called the Neogard, include: Spark-proof operation



HUBBARD ONE PIECE STREET HOOD BRACKETS

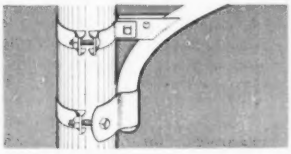
Installation on Steel Pole (See diagram)



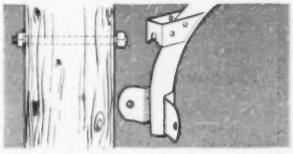
Installation on Wood Pole

ANOTHER FIRST– Hubbard, One Piece, Upsweep Brackets are a development in Street Lighting made necessary partly by the requirement for higher mounting of Luminaires, without setting new poles and without "wasting" pole space for bracket supports, and partly by a demand for greater simplicity and efficiency plus low cost. They can be mounted at the pole top if desired.

Furnished in lengths from three to six feet, these arms are all "one piece" design requiring no pole plates, braces, brace clips, insulator bushings or other fittings. They can be attached by one man. There are no sharp bends or other obstructions to hinder internal wiring. Complete data is forthcoming on these and greater lengths. Write for your copy.



Design of the Hubbard "One Piece" Street Lighting Bracket allows use on wood or steel poles merely by the application of pole bands. No change in design of the arm.



The new, exclusively Hubbard, Keyhole type (Patent applied for) of attachment above permits installation by one man.

HUBBARD AND COMPANY

PITTSBURGH CHICAGO **OAKLAND, CALIF.**

KOPPERS
POLE
"1978 Model"
Koppers could readily call this Pole their "1978 Model," and *still* be conservative. Because Koppers Full-Length Pressure-Creosoted Poles have an average life span of *over* 30 years.
It is this proved durability that makes Koppers Full-Length Pressure-Creosoted Poles the logical answer to high maintenance and replacement costs . . . that greatly prolongs the periods of *uninterrupted* company service.
For long-lasting poles, specify Koppers. Deliveries of needed sizes are made promptly from conveniently located treating plants.
KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.
KOPPERS
PRESSURE-CREOSOTED WOOD

with no need for ground; triple waterproof seal; Pyrex lamp, with heavy-braced tungsten filament, for weather and handling resistance; and Neoline's Neolock 105 plug for use in any outlet.

The light is $1\frac{3}{4}$ in. in diam and $12\frac{1}{2}$ in. long; a Neoprene-covered cord is available in lengths of 25, 50 and 100 ft.

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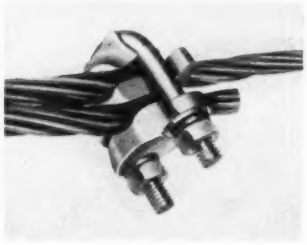


U-Bolt Connector

SUITABLE for tapping or splicing parallel conductors in substations, on transmission lines and in industrial services where high pressure connections are desired and high current values are expected, a new type U-bolt connector is available from the A. B. Chance Co. Utilities Division, Centralia, Mo. This unit has slotted swinging spacer and bottom clamp for joining conductors without removing nuts and lock washers.

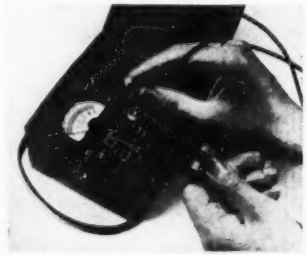
The connector, which may be applied hot, comes in three sizes which cover the range of conductors from No. 4 solid copper to 500,000 CM. These joining units are furnished either in a heat-treated all-aluminum alloy type or with top clamp and spacer of copper, bottom clamp of alloy No. 2, and U-bolt and nuts of Everdur.

•

Indicating Instrument

INTERNATIONAL INSTRUMENTS, Inc, 311 East St, New Haven, Conn., announces the development of the Miniature Multitester, a combination ohmmeter and voltmeter, for testing resistance and both a-c and d-c voltages.

As an ohmmeter, the manufacturer claims the instrument will indicate re-

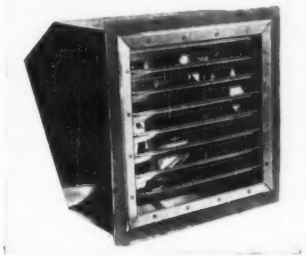


sistances from 0 to 2 million ohms, with an accuracy of plus or minus 2% of linear scale. It registers d-c voltages from 0 to 300 v, with a claimed accuracy of plus or minus 2% at 10,000 ohms per v. A-c voltage indication, from 0 to 10,000 ohms per v, is stated to be accurate to within plus or minus 5%.

The tester is fitted with a toggle switch for a-c or d-c testing; a pair of jacks into which test leads are inserted; and a rotary switch for selecting the voltage range from 0 to 50/150/300 v.

Two replaceable dry batteries are enclosed in the base of the case, readily accessible for replacement. The unit, without leads, weighs only 12 oz.

•



Ventilation System

DEVELOPMENT of a thermostatically-controlled ventilation system, said to eliminate excessive humidity in dairy and stock barns in cold weather, has been announced by Holcomb & Hoke Mfg Co, Inc, 1540 Van Buren St, Indianapolis 7, Ind.

This system, the Silent Breeze Ventilation for Dairy and Stock Barns, is a completely assembled unit which can be installed by the purchaser. Built to serve barns housing up to 40 animals, the unit incorporates a 4-blade, direct-connected 24-in. fan; a 1/6-hp, 2-speed, 115-v single-phase motor with thermostat; and an outlet hood to protect fan and motor from the weather.

The entire unit can be mounted in a 30x30 in. opening in the barn wall.

•

Vibration Recorder

TO HELP engineers analyze the vibrational effects of heavy machinery on factory walls, a portable "seismograph" for use in industry has been developed jointly by the Barry Corp of Cambridge, Mass., and Westinghouse Electric Corp, Baltimore, Md. This instrument is said to answer the need for a quick, simple means of recording vibration, even when no steady reference point is available.

The Westinghouse Vibrograph, about

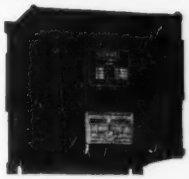
SORGEL
AIR-COOLED
TRANSFORMERS

Prompt Deliveries
of Dry-Type Transformers

50 Kv-a. and smaller
usually from stock

¼ Kv-a.
Single Phase
460/230 to
115 volt

A size and type for
every purpose.
1/4 Kv-a. to 2000 Kv-a.
All voltages.
Single phase and 3-phase.



3 Kv-a. 3-phase
Wall Mounting Type

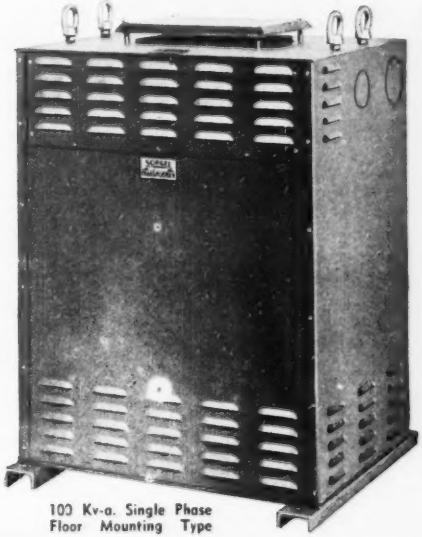
Liberal Design.

Steel Encased.

Solderless
Terminals.

Connection
Compartment.

Quiet Operation.
Low Temperature.
High Efficiency.
Long Life.
Priced Right.



100 Kv-a. Single Phase
Floor Mounting Type

SORGEL ELECTRIC CO. 834 W. National Ave., Milwaukee 4, Wis.
Pioneers in the development and manufacturing of Air-Cooled Transformers

BERMICO* FIBRE CONDUIT

BERMICO CONDUIT IS REALLY RUGGED—IT'S BUILT TO TAKE ROUGH HANDLING ON THE JOB.
ITS CLEAN, SMOOTH BORE MAKES PULLING CABLES THROUGH BERMICO FIBRE CONDUIT QUICK AND EASY.

distributed by
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
Offices in all leading cities

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

the size of an ordinary box camera, usually embosses a permanent record of vibrations on a transparent film. It records the range of 600 to 15,000 cycles per min and amplitudes as low as 0.0001 in. or as great as 0.0625 in.

Positioned on the Barry seismic pendulum mounting, the Vibrograph can measure frequencies as low as 120 cycles per min.

•

All-Weather Covered Wire

RoLENE weatherproof wire, a polyethylene-covered wire, is now manufactured by the Rome Cable Corp of Rome, N. Y. The manufacturer states that features of this covered wire include: Resistance to moisture, abrasion, sunlight and other weather hazards; long life, with no braids to festoon or rot; and lighter weight and smaller diameter.

RoLene wire is available in sizes from No. 12 through No. 4 AWG with solid bare copper conductors, and in sizes No. 2 and 1 AWG with concentric stranded bare copper (seven wires). Conductors may be furnished as soft, medium hard-drawn or hard drawn in accordance with ASTM specifications.

•

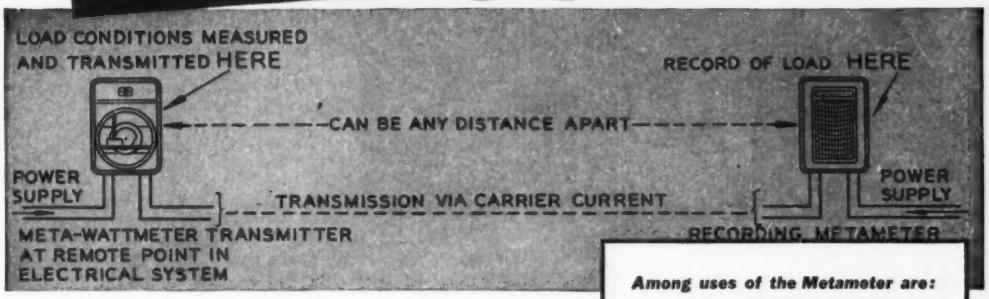
Automatic Splice

A NEW type JS Series "Junior" automatic splice is announced by Fargo Mfg Co, Inc, Poughkeepsie, N. Y. The manufacturer describes its application

TELEMETERING

gives you accurate information on conditions miles away...

Continuously


LOAD CONDITIONS MEASURED AND TRANSMITTED HERE
RECORD OF LOAD HERE
CAN BE ANY DISTANCE APART
POWER SUPPLY
TRANSMISSION VIA CARRIER CURRENT
POWER SUPPLY
META-WATTMETER TRANSMITTER AT REMOTE POINT IN ELECTRICAL SYSTEM
RECORDING METAMETER

Bristol's Metameter System of Telemetering gives an accurate, up-to-the-minute account of conditions at remote points . . . enables you to anticipate abnormalities . . . prevent them from developing into emergencies. It gives you the facts you must have to operate your facilities at top efficiency.

The impulse-duration principle on which the Bristol Metameter works gives you the further advantage of a choice of transmitting media: carrier channel . . . simple two-wire circuit . . . radio beam . . . or any convenient circuit you may select. Why not get the full facts on Telemetering of electrical quantities? Write for Bulletin M1702. THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 91, Conn. The Bristol Co. of Canada, Ltd., Toronto, Ontario. Bristol's Instrument Co., Ltd., London N.W. 10, England.

Among uses of the Metameter are:

FOR LOAD DISPATCHER OF CENTRAL STATION SYSTEM

1. Load (active and reactive power and power demand) in each tie-line interconnecting system with neighboring system.
2. Output, or total generated power, of each generating station.
3. Total output of all generating stations, on a single instrument.
4. Active and reactive power and power demand at key points on important transmission circuits.
5. Water level and waterwheel gate position in hydro-electric plant.

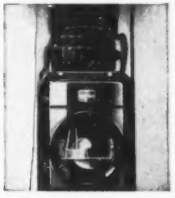
FOR OPERATOR OF GENERATING STATION

1. Total output generated in system.
2. Output of each associated attended or unattended generating station in system.
3. Desired output of operator's own station.

FOR DISPATCHER OF DISTRIBUTION SYSTEM

1. Total kilowatt load on unattended substations.
2. Bus voltage at unattended station.
3. Feeder amperes.

Metameter Transmitter mounted on transformer at country substation



A typical Metameter Transmitter installation

Typical Metameter Receiver installation in dispatcher's office

IMMEDIATE DELIVERY

Bristol has hundreds of recording and controlling instruments as well as pyrometers and thermocouples in stock for immediate delivery. Send for Bulletin W1811 Stock Instruments and Bulletin P1235 Thermocouples and Pyrometer Accessories.

BRISTOL

metameter keeps you a jump ahead of demand

BALLAST BAKER

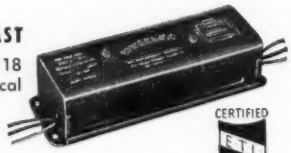
Before the coil and core structures of Wheeler Ballasts are housed and potted, they're varnished under pressure to insure maximum impregnation. These varnished components are then baked in an oven at 275° F. for a specified length of time — as a further means of making sure the varnish is cured and the unit completely bonded and insulated.

This is just one in a series of carefully predetermined processes through which Wheeler Ballasts must go before they're released to our customers. Every step is continuously checked. Ballasts are inspected at regular intervals to insure uniformity of quality and conformity to rigidly set specifications.

Wheeler Ballasts for fluorescent lamps are the result of sound engineering and strict adherence to proved production practices. You'll benefit by specifying Wheeler Ballasts in your fluorescent equipment.

WHEELER BRICK-TYPE BALLAST

For two-lamp operation. 40 watt, 118 volt, 60 cycle; certified by Electrical Testing Laboratories, Inc. Also for 220 volts, 50/60 cycle. All U. L. Approved.



WRITE TODAY FOR COMPLETE BALLAST INFORMATION

THE WHEELER INSULATED WIRE CO., INC.

SERVICE QUALITY WHEELER DEPENDABILITY

DIVISION OF THE SPERRY CORPORATION
1301 EAST AURORA STREET
WATERBURY 91, CONNECTICUT
MAGNET WIRE • COILS • COMMUNICATIONS EQUIPMENT

as being an improvement over the manual method. This splice is made with the same type of gripping jaw as the reclaimable type but is smaller in size. It has a copper shell with swedged ends which contain the gripping jaws.

The "Junior" is reported to make splicing operations faster and safer for the line man, requires no extra tools and makes a permanent connection. Strengthwise, it develops the full mechanical breaking load of the conductor; electrically, the resistance of a foot of wire with the splice is no greater than the conductor alone. The "Junior" automatic splice is said to cost less because it is made for one size and type of solid copper wire only, for each splice, and is non-reclaimable. It is available in three sizes, including No. 6, 4 and 2 solid copper wire. Further details can be obtained by writing the manufacturer.

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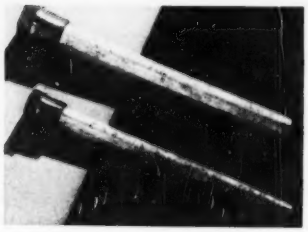


Corrosion Inhibitors

REPLACEABLE Cor-In zinc rods, which extend the protection of galvanizing and further inhibit corrosion after galvanizing has been eaten away, according to the manufacturer, are suitable for use in industrial radiators, water and oil coolers, heaters and other heat exchangers.

Available from Rotometals, Inc, 980 Harrison St, San Francisco 7, Cal., these Cor-In corrosion inhibitor zinc rods are fitted with standard pipe-plug ends which permit replacement by merely unscrewing the used-up zinc and screwing in a new rod. They come in $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and 1-in. diam, with lengths up to 12 in.

•

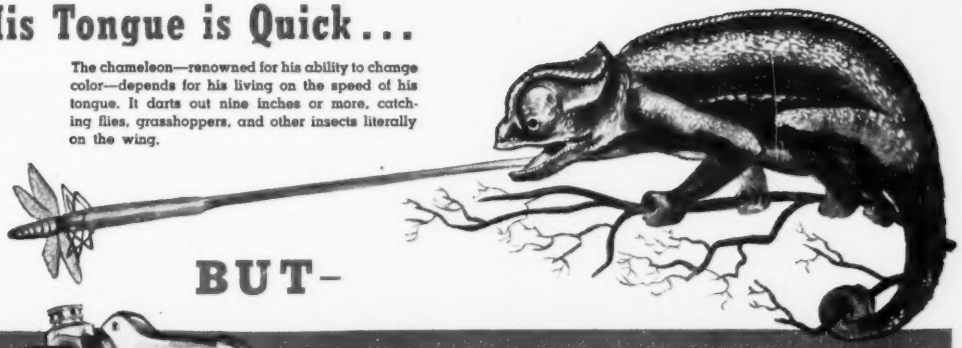
Diffusing Fixtures

GLARE-FREE lighting and virtual elimination of shadows are said to be achieved with Cell-Ceil, a honeycombed fixture introduced by Federal Enterprises, Inc, 8700 S. State St, Chicago, Ill., for use in factories, offices and school rooms.

The fixture consists of prefabricated, louvered, all-steel material made up in honeycombed panels that form a continuous ceiling below existing lighting

His Tongue is Quick...

The chameleon—renowned for his ability to change color—depends for his living on the speed of his tongue. It darts out nine inches or more, catching flies, grasshoppers, and other insects literally on the wing.



BUT—

Nothing is Quicker than GENERAL QUICKAID FIRE GUARD For Fighting Fire!

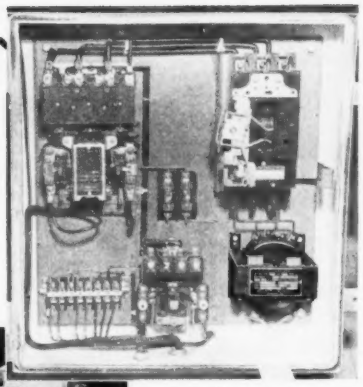
Your life or your property may depend on the speed of your fire fighting equipment. A few seconds may spell the difference between a tiny flame and an unmanageable blaze. Quick-Aid Fire Extinguishers save you precious seconds because they operate quickly, cleanly, efficiently. Quick-Aid Carbon Dioxide Extinguishers (illustrated here) are available in all sizes from 2½ to 100 lbs. They are Underwriters' Approved and especially recommended for fires in electrical equipment, gasoline, and chemicals. Look in the classified section of your telephone book for the Quick-Aid trade mark or write direct for the name of your nearest dealer.

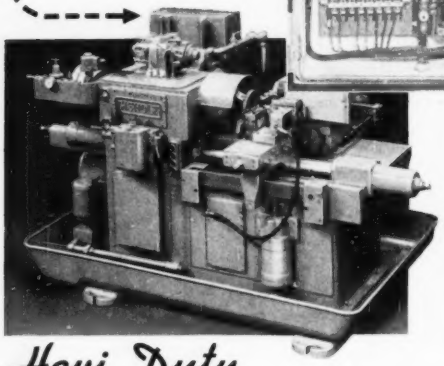
IF IT'S GENERAL IT'S DEPENDABLE

THE GENERAL DETROIT CORP.
DETROIT 7, MICHIGAN
NEW YORK • ATLANTA • CHICAGO • DALLAS

Subsidiaries:
THE GENERAL PACIFIC CORP.
LOS ANGELES • SAN FRANCISCO • SEATTLE
THE GENERAL DETROIT CORP., CANADA, LTD.
WINDSOR • MONTREAL • TORONTO • WINNIPEG

When good regulation at low power factor loads with heavy inrush currents are required, Hevi Duty Control Circuit Transformers are first choice!





The GISHOLT No. 12 Hydraulic AUTOMATIC LATHE . . . designed for high production chucking work to meet new machine tool specifications for automatic use. Unusual requirements for lighting and contactor loads are met with Hevi Duty Transformers.

Hevi Duty

Control Circuit TRANSFORMERS

give you *better* regulation

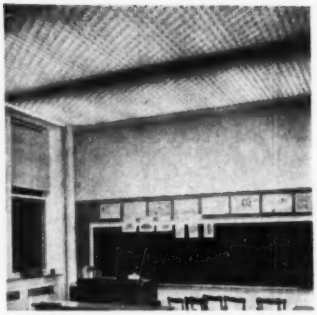
Regulation curves quickly reveal the fact that you get extremely good regulation at low power factor when you use the properly designed Hevi Duty Control Circuit Transformer. In addition, you get rugged mechanical construction, oversize terminals permanently attached to coils during winding, and many other features that assure dependable performance. Regulation curves and complete engineering data are available. Write today.

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

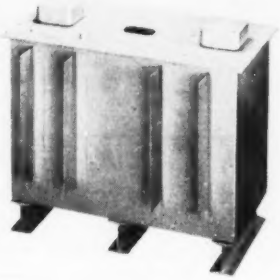
MILWAUKEE 1, WISCONSIN



units. It can be used to conceal overhead pipes, sprinkler systems and air ducts without impairing their effectiveness.

The panels come in 24 or 30-in. widths and in lengths varying from 12 to 96 in.; have a weight of 12 oz per sq ft; and are finished in pastel shades of baked enamel.

•



Selenium Rectifiers

CLARK ELECTRONIC LABORATORIES, Box 165, Palm Springs, Cal., now produces oil-cooled Celab selenium tank rectifiers, complete with transformers, for industrial use. All sizes from 1 to 100 kw are available.

The unit shown is a 10-kw, 3-phase power rectifier which supplies 250-v, 3-wire, d-c service. It measures 14 x 28 x 21 in. and is said to operate continuously under full load at 65 C oil temperature.

•

Insulation

QUINORCO No. 3000 asbestos paper is a thin electrical insulation produced by Johns-Manville Corp, 22 East 40th St, New York 16, N. Y. It is reported as 85% asbestos, about 15% organic by weight, and to qualify as AIEE Class B insulation. Manufacturers can employ it as strap insulation and layer insulation in large generators.

"The men like to work with penta-chlorophenol treated poles! —THEY'RE CLEAN!"

Workmen, who maintain communication and power lines, enjoy working with poles that have been given the PENTA-chlorophenol treatment. This modern wood preservative leaves poles clean and easy to handle.

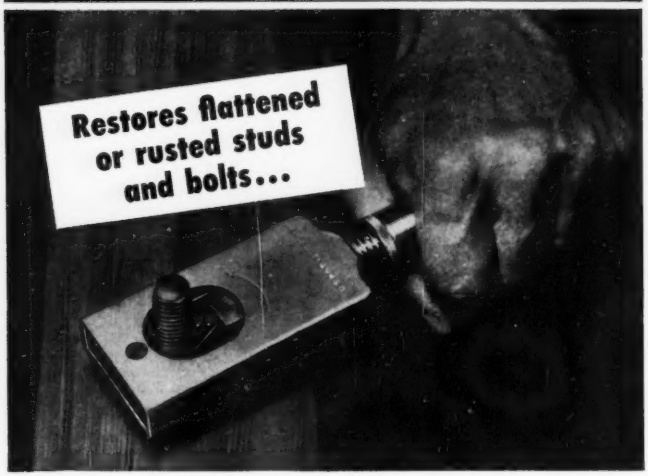
Utility companies everywhere have found that PENTAchlorophenol-treated poles *last longer*, for they have been given thorough, lasting protection against decay and termites.

Specify the PENTAchlorophenol treatment for safeguarding *your* poles and other wood construction.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

DOW
penta-
chlorophenol

BUCKINGHAM THREAD CLEANER



NOW — remove rust and recondition damaged threads this fast, simple way. A few quick twists of the Buckingham Thread Cleaner and presto! — the threads are slick and clean. Flats are smoothed-out . . . Nuts spin on and off in a jiffy.

This versatile thread cleaner saves time on field work, too. There's no need to remove a damaged stud . . . no hacksawing or drilling . . . no re-tapping of the hole. Simply slip the tool over the mutilated stud or bolt, tighten the cutting jaws and twist. That's all!

Buckingham Thread Cleaners follow the pitch of any right- or left-hand thread with a root diameter from ¼" to 2 9/16". Separate thread cutting dies are not required — the adjustable cutting jaws of the Cleaner are easily set to the proper size . . . *on the bolt*. Once adjusted, the setting is maintained by the single lock nut on the knurled handle.

Buckingham Thread Cleaners are available in two sizes:

No. 6103 ..... ¼" to 1" root diameter; Weight, 15 Oz.; Price $6.50

No. 6104 ..... 1" to 2 9/16" root diameter; Weight, 2 lbs.; Price $13.00

BUCKINGHAM equipment is sold by over 400 authorized dealers. See the Buckingham Thread Cleaner at the dealer nearest you, or write today for additional information on this versatile, time-saving tool.

BUCKINGHAM MANUFACTURING CO., INC.
5-7 Travis Street — Binghamton, N. Y.

motors, transformers and the like.

Four standard thicknesses are: 0.005, 0.007, 0.010 and 0.015 in.; available in 36-in. wide rolls on 3-in. cores or in tapes ¼, ⅜, ½, 1 and 1¼ in. wide on either 1½ or 3-in. cores.

Thickness, inches	0.005	0.007	0.010	0.015
Basic weight, pounds per 100 sq ft.	1.5	2.2	3.3	4.7
Tensile, pounds per inch width				
Machine direction	14	18	22	26
Cross machine direction	7	10	14	16
Dielectric strength, volts per mil	500	420	350	300
Magnetic rating, percent	0.55	0.64	0.70	0.80

Performance which may be expected is shown in the table.

As its name suggests, Quinorgo is partially organic and should not be confused with Quinterra, which is completely inorganic (ELECTRICAL WORLD, Aug. 28, 1948, page 113).

MORE NEW PRODUCTS about which you should know

Mission Electric Mfg Co, 132 W. Colorado Blvd, Pasadena, Cal., has developed an explosion-proof, 1/200-hp a-c or d-c **motor** with load speeds of 5,000-20,000 rpm and free speeds of 10,000-40,000 rpm. . . . Ransome Machinery Co, Dunellen, N. J., is producing **turning rolls**, for welding operations, that allow all welds to be made in the downward position. . . . Speed-O-Matic Sales, Inc, Chicago, Ill., has announced portable, electric, impact **nut setters** in universal, 110-v, 60-cycle and 220-v, 180-cycle, 3-phase models, which can set from ⅜ to ¾-in. bolts.

All-State Welding Alloys Co, Inc, White Plains, N. Y., has available No. 22 phosphor-bronze **electrodes** for arc welding in bearing and corrosion-resistant applications. . . . Bishop Gutta Percha Co, 420 E. 25th St, New York 10, N. Y., is producing a self-bonding, Bi-Seal **insulating tape** of synthetic polymers and resins that has a dielectric strength stated to be better than 1,000 v per mil. . . . Superior Electric Co, 424 Hannan Ave, Bristol, Conn., is offering a 5-way **binding post** rated at 30 amp and 1,000 v.

Metallizing Engineering Co, 38-14 30th St, Long Island City 1, N. Y., manufactures a Metco Type 2W **wire straightener** which handles any size or type of metallizing wire. . . . Radio Frequency Corp, Boston 34, Mass., has announced a 3,000-w high frequency **heater**, Model 3000-B, for brazing, soldering and heat treating metals.

CENTRAL
~~SPANG~~
CONDUIT

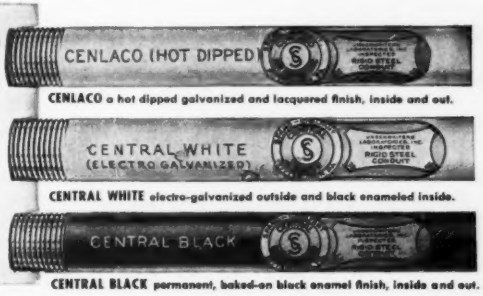
Your Central Rigid Steel Conduit Distributor is proud of his record of prompt delivery. And he fights to maintain that record, even if it means extra hours or personal inconvenience.

BUT

At times he can't make fast delivery of Conduit. One reason for this, is today's critical shortage of steel which prevents us from producing enough Central Conduit to provide your distributor with all he needs to meet the greatest demand in history.

You can depend on this, though—when your Central Rigid Steel Conduit Distributor gets conduit, you will quickly receive a fair share of his stock.

SPANG-CHALFANT
Division of The National Supply Company
General Sales Office: Grant Bldg., Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities



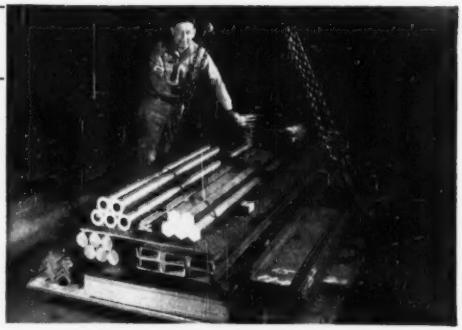
CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

Ryerson Answers Important Steel Questions

What can we get?

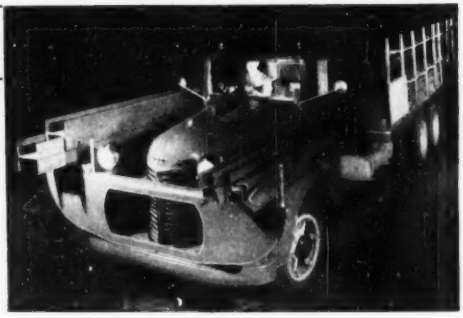


You can usually get enough carbon, alloy or stainless steel from stock to meet maintenance and repair requirements—and some new equipment needs as well. Tremendous demand often limits the amount that can be shipped, but stainless is in particularly good supply—in fact both alloy and stainless bar stocks and carbon and stainless tubing stocks are better than average. See the product list below.

Where can we get it?

For next-door steel service, call your nearest Ryerson plant or office. The nationwide network of Ryerson plants brings steel stocks within short shipping distance of almost any delivery point. As an added convenience for steel buyers, Ryerson maintains sales offices in many cities, connected by direct wire to a neighboring plant.

When can we get it?



When the steel you need is on hand, you get delivery promptly from Ryerson—24-hour service in emergencies. If your requirements are not immediately available, we may be able to suggest workable alternates. We will certainly do our best. And remember, our stocks turn over quickly. We may have kinds and sizes tomorrow that are out of stock today.

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BABBITT—bearing metal
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RYERSON STEEL

NEWS ABOUT PEOPLE

GE Elects Three V-Ps; Huether Gets New Post

Announcement has been made by the General Electric Co of the election of three new vice-presidents, Harold F.

H. F. SMIDDY

Smiddy, Clarence C. Walker and Ralph M. Darrin, and of the appointment of John J. Huether as manager of the company's central station divisions.

In his new executive position, Mr Smiddy continues as general manager of both the company's air conditioning and chemical departments. Mr Walker was recently made general manager of the construction materials department.

R. M. DARRIN

Detailed biography of Mr Walker was published in Electrical World, Dec 4, 1948, p. 146. Mr Darrin has been elected a commercial vice-president and assigned to customer relations work in

J. J. HUETHER

the New England territory with headquarters in Boston.

Mr Huether, who is succeeding Mr Darrin, will continue as manager of the transportation division, the position he has held since last April. He joined the company's test course in 1922 and a year later was assigned to the a-c engineering department. Later he held several positions in the industrial department.

•

▶ H. F. G. MAIN has been appointed rate engineer of the Potomac Electric Power Co, Washington, D. C., and in this capacity will head the rate department, heretofore known as the research department. Mr. Main succeeds EDWARD T. STEEL, retired, who, as research engineer, has headed the research department since he formed it soon after joining the company in 1932.

▶ DR GEORGE R. HARRISON, noted physicist and dean of the School of Science, Massachusetts Institute of Technology, has been awarded the Medal of Merit in recognition of his war services. The medal was presented by Dr Karl T. Compton, chairman of the M.I.T. Corporation and chairman of the Research and Development Board of the National Military Establishment, Washington.

▶ MATTHEW BALLS has been appointed assistant vice-president of the Shawinigan Water & Power Co, Montreal. Mr Balls will continue to direct operations of the water resources department, of which he has been manager since 1941.

Coldwell Named President of Ford, Bacon & Davis

Ford, Bacon & Davis, Inc, engineers, have announced the election of E. S. Coldwell as president, succeeding James F. Towers, who will actively continue as chairman of the board of directors. Mr Coldwell will at the same time suc-

E. S. COLDWELL

ceed Mr Towers as president of Ford, Bacon, & Davis Construction Corp, Monroe, La., a wholly-owned subsidiary of Ford, Bacon & Davis. Mr Towers will also continue as chairman of the board of the construction company.

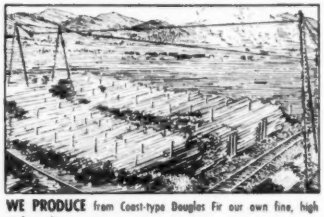
Mr Coldwell has been identified with the organization since 1926. Details of his career were published two years ago, when he was made executive vice-president (EW Feb 15, 1947, p. 151).

•

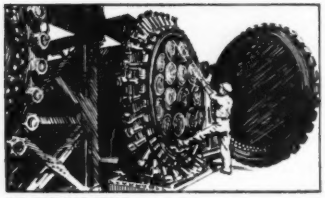
▶ MILTON C. NICHOLS has been appointed distribution supervisor for the Gardner (Mass.) Electric Light Co. He joined the meter department of the then Worcester Electric Light Co in 1923 and in 1946 became assistant superintendent of distribution for the Worcester County Electric Co.

▶ WILLIAM B. PETCH, formerly connected with the commercial lighting department of the Public Service Co of Colorado, Denver, is now commercial manager of the Cheyenne (Wyo.) Light, Fuel & Power Co. He succeeds CHARLES J. HUGHES, who is on leave of absence. Mr Petch has gained recognition as an illuminating engineer, having been identified with some of the

Need Poles Quick?



WE PRODUCE from Coast-type Douglas Fir our own fine, high quality poles



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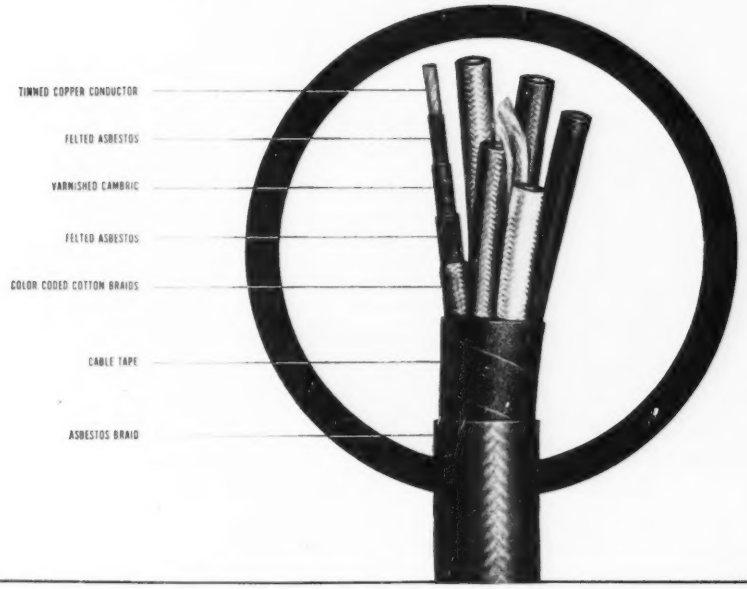
most important modern lighting installations in Denver and at other points on the company's system. He was one of the local pioneers in promoting fluorescent lighting for use in the home. Earlier in his career, Mr Petch had been connected with the Cleveland Electric Illuminating Co, Ohio Power Co, Canton, and Landers, Frary & Clark of New Britain, Conn.

► Wallace C. Husted has been elected executive vice-president of the Chase Brass & Copper Co, Inc, Waterbury, Conn. This position has not been filled since it was relinquished by Charles E. Hart in 1942, when he became president of Chase. Mr Husted has been connected with the Chase organization since 1929, when he became identified with the Waterbury Manufacturing Co plant. After engaging in accounting work and serving as factory manager, he was made general manager in charge of both production and sales activities. In 1944 Mr Husted was elected vice-president of Chase Brass & Copper Co in charge of the company's Cleveland operations and two years later returned to Waterbury to become vice-president in charge of plant operations and organization.

► Carl G. Leyse has been appointed manager of utility sales of the Kennecott Wire & Cable Co, Phillipsdale, R. I. Shortly after his discharge from military service in World War I, Mr Leyse entered the employ of the American Electrical Works in the Chicago office. He represented that company and its successor, the Kennecott Wire & Cable Co, in a sales capacity until 1940. At that time he was transferred to the St. Louis office of the Chase Brass & Copper Co, where he has since been in charge of the sale of Kennecott Wire & Cable products which are distributed through Chase Brass.

► F. R. Benedict has been appointed manager of the headquarters engineering departments of the Westinghouse Electric Corp. In his new position, he will be responsible for the operations of the industry engineering, foreign engineering, and the engineering laboratories and standards departments. Mr Benedict joined Westinghouse in 1928. He was a laboratory engineer in the company's high-voltage laboratory at Trafford, Pa., engaged in special studies on insulating materials and then became engineer in charge of the Trafford Laboratory and of the Impulse Laboratory at East Pittsburgh. In 1938 he was made liaison engineer on the chief engineer's staff and early in 1940 was transferred to the district engineering and service department. A year later he was appointed manager of en-

This Just Goes to Show...
with cable, it isn't the cost
—it's the upkeep!



An Eastern Electric Utility used single conductor ROCKBESTOS AVC Wires and Cables for years.

But for "economy" they had been using ordinary low temperature control cable in their generating stations on vital control circuits to main steam boilers — burner tilt mechanisms and main power valves.

These circuits are close to steam lines — where it's hot! *Ordinary* control cables didn't stand up.

Convinced that ROCKBESTOS AVC . . . *Asbestos-Varnished-Cambric* . . . Permanent Insulation pays for itself in longer life, less maintenance and fewer outages, the Company has now replaced the ordinary control cable in this hot spot with ROCKBESTOS Table MD AVC Control Cable.

It will pay *YOU* to know the ROCKBESTOS story! Write.

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WIRES and CABLES by

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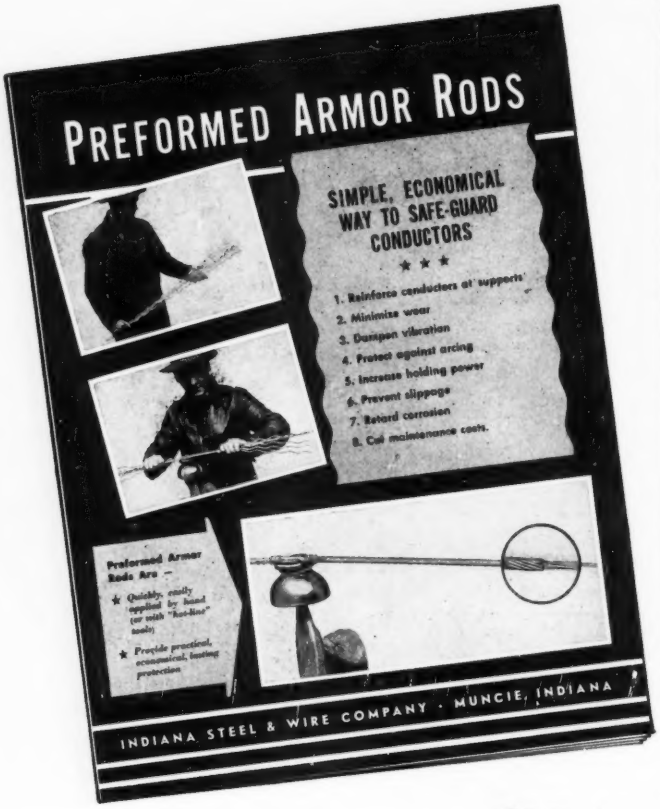
....*dare* to be better


PREFORMED ARMOR RODS
SIMPLE, ECONOMICAL WAY TO SAFE-GUARD CONDUCTORS
1. Reinforce conductors at supports
2. Minimize wear
3. Dampen vibration
4. Protect against arcing
5. Increase holding power
6. Prevent slippage
7. Retard corrosion
8. Cut maintenance costs.
Preformed Armor Rods Are —
★ Quickly, easily applied by hand (or with "hot-line" tools)
★ Provide practical, economical, lasting protection
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Write for This Booklet!

PREFORMED ARMOR RODS provide a simple, practical, economical method of reinforcing and protecting overhead conductors at the point of and in the region of the supports. They minimize wear and chafing, tend to absorb and dissipate vibration, protect the conductor against arching and flash-overs, afford increased holding power against slippage, lessen the possibilities of corrosion, reduce overall maintenance expense.

Easily applied by hand or with "hot line" tools. Available in galvanized or stainless steel, aluminum, copper or bronze.

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gineering and service in the New England district. Later he became manager of the product analysis section and then manager of the industry engineering department.

OBITUARY

Robert J. Graf

Robert J. Graf, chairman of the board and former president of H. M. Byllesby & Co. investment bankers, died on Jan 2 of a heart attack at his home in Libertyville, Ill. He was born in Washington, D. C. 66 years ago.

Mr Graf had been a Byllesby man ever since H. M. Byllesby & Co was founded in 1902, at which time he joined the organization at the age of 20 as secretary and assistant treasurer. In 1914 he was elected vice-president and ten years later he became first vice-president on the death of Col H. M. Byllesby. In 1936 he succeeded John J. O'Brien as president and in 1946 became board chairman.

In the course of his career, Mr Graf also held executive positions with Byllesby Engineering & Management Corp, Standard Gas & Electric Co, Standard Power & Light Corp and their subsidiary and affiliated companies.

He was a member of the old National Electric Light Association, and its successor, the Edison Electric Institute, and was a life member of the American Institute of Electrical Engineers.

•

Griffith Asplundh

Griffith Asplundh, president of the Asplundh Tree Expert Co, Jenkintown, Pa., and a pioneer in utility line clearance, died on Dec 24 of a heart attack at his home in Bryn Athyn, Pa. He was 53 years old.

A native of Bryn Athyn, Mr Asplundh founded the Interstate Tree Craft Co shortly after graduation from Penn State in 1923. In 1928, in association with his brothers Lester and Carl, he organized the Asplundh Tree Expert Co. He introduced training schools, rigid safety codes, and standardization of techniques and tools.

Mr Asplundh was also president of the Utilities Line Construction Co, which he organized in 1936.

•

▶ GEORGE T. TWYFORD, electrical engineer for the Potomac Edison Co, Hagerstown, Md., died on Dec 6 at his home in that city after an illness of three months. Mr Twyford had been associated with Potomac Edison for 31 years. He obtained his early engineering experience with the Westinghouse Electric Corp. In 1917 he was named electrical engineer in charge of Poto-

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ON BRUSHES FOR SMALL UNIVERSAL MOTORS

Money and Commutator Saving Brushes for AC-DC Motors

Write for fractional
H. P. BRUSH USER'S GUIDE
This 44-page book is a helpful guide for evaluating brush materials and choosing the one best suited for your particular motor and application. Write on company stationery for a copy.

Without exception, leading makers of small AC-DC motors who have used Stackpole grades of brushes *have reported materially longer brush life and less commutator wear!*

Although some new Stackpole brush grades have high specific resistance, their contact drop is such that both motor speed and torque are essentially the same as when conventional electrographitic brush grades are used. Mechanical strength is exceptionally high—a particularly desirable characteristic in small universal motor brushes. Also, various Stackpole brush grades have shown excellent results on AC-DC motors having undercut mica as well as those with the flush mica commutator bar type of insulation.

TEST SAMPLES TO QUANTITY USERS . . .

The one way to tell about motor brushes is to try them on your own equipment, under actual operating conditions. We're so confident that Stackpole Brushes will show you a real saving that, providing you are a quantity user of small universal motor brushes, we'll gladly send samples for test. Give full details of your motor rating, application, and brush data.

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Because it's Powerful but Small, Light Pulls 500 lb. (with big factor of safety), yet is easily carried on lineman's belt, weighs but 6½ lb. Compact enough to fit into a one-foot space.

Because it's Easy to Use, Fast The "Mighty-Midget" replaces heavy, complicated equipment. It is simple in design, simple to operate. Handle can be used either as a lever or a high-speed crank. Mere 28-lb pressure on handle pulls 500 lb.

Ask your distributor for more information on the "Mighty-Midget" or write for Bulletin EMP-1.

For Heavier Jobs—stretching heavy guys or cables, laying underground conduits, etc., use a "Safety-Pull" Ratchet Hoist. The ¾-ton model weighs but 14 lb.—eight other models, handling up to 15 tons.

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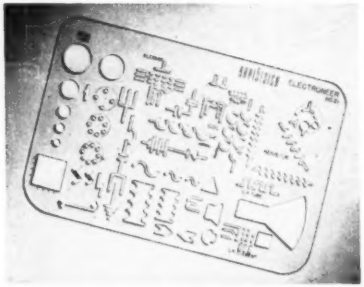

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The Electroneer has all electrical and industrial electronic symbols. In addition, all diagramatic elements of the electronic and cathode ray tubes are provided for in the template PLUS tube bases of the 4, 7 and 8 prong type. Uniform, clean-cut symbols are quickly and easily constructed.

The Electroneer is made of clear, super quality cellulose nitrate sheet of .040 thickness. Symbol cutouts are smooth beveled to assure clean, accurate lines. Actual size of instrument is 4¼" x 6½".

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mac Edison substation maintenance and construction and transmission engineering at Hagerstown.

•

Harry L. Snyder

Harry L. Snyder, formerly president of the New York and Queens Electric Light & Power Co. since absorbed by the Consolidated Edison Co of New York, died in Montclair, N. J., on Jan 3. He was 83 years old.

A native of Jersey City, N. J., Mr Snyder became active in the utility industry in the Borough of Queens in 1899, when he assisted in the purchase and merging of gas and electric properties to form the New York & Queens Gas & Electric Co. When the company was reorganized into two companies, one electric and one gas, he held executive positions in both, but later devoted all his time to the development of the electric company. He became vice-president of the New York and Queens Electric Light & Power Co in 1925 and later in the same year was made vice-president and general manager. In 1932 Mr Snyder was named president.

•

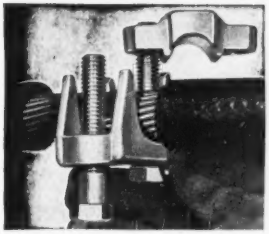
▶ PETER WHITE, electrical engineer for Ebasco Services Inc, died suddenly of a heart attack on Dec 12 in New York. Born in Chicago in 1914, Mr White was a member of Ebasco Services from 1936 to 1941 as junior engineer and assistant engineer on special transmission, distribution, short circuit, relay, and power system studies. After service in World War II, he became identified with the Westinghouse Electric Corp, during 1944-45 being connected with the editorial service department. In 1946 Mr White rejoined Ebasco Services as electrical engineer and had been active in power system planning studies and general engineering work on electrical engineering projects.

▶ CARLETON MACY, president and general manager of the Queens Borough Gas & Electric Co, Far Rockaway, N. Y., from 1903 to 1927, died on Jan 4 at his home in New York after a long illness. He was 76 years old. Early in his career, Mr Macy was connected with the General Electric Co at Schenectady, Denver, Colo., and in New York. In 1902 he became treasurer and assistant to the president of the Queens Borough Gas & Electric Co. In 1907 he was made president of the Hewlett Bay Co and since then had been active in developing Long Island real estate.

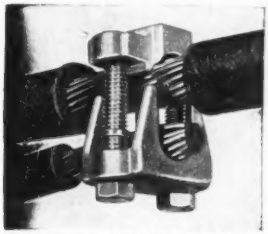
▶ SIDNEY G. HAWLEY, for the past 20 years director of purchases of the Janette Manufacturing Co, Chicago, died recently.

More Efficient Connectors For Large Conductors

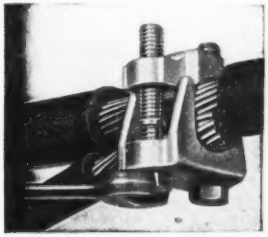
Save Up To Half Your Cost



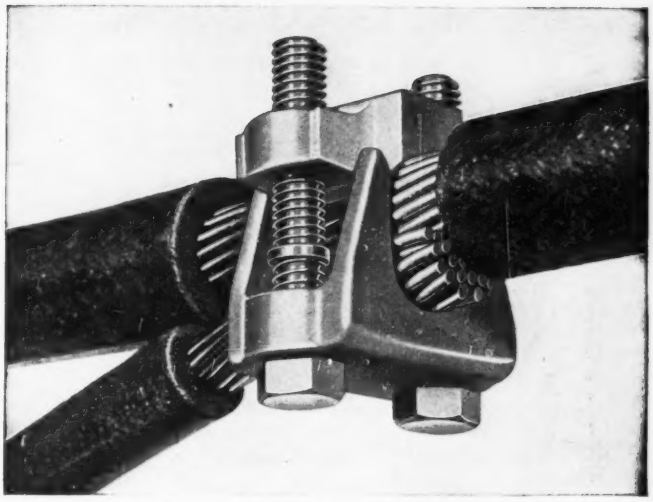
After fitting connector on conductor as above, place upper clamping member in position as shown below and partially thread free cap screw into it.



With connector in position on conductor as shown, install tap-off wire and equally draw up cap screws.



Continue to draw up cap screws until connector is securely tightened. Note easy access of wrench to heads of cap screws.



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You can cut your initial costs on large size wire connections up to 50% by using Matthews Uniclamp Connectors.

You can get them for 1/0, 2/0, 4/0, 350 MCM, 500 MCM and 750 to 1000 MCM stranded copper wire—or 1 ACSR to 1033 MCM ACSR aluminum wire. They can be furnished for copper to copper, aluminum to aluminum, or aluminum to copper and other bi-metal connections. You can install any size with an eight inch wrench and get permanently tight and trouble free connections. They will accommodate two conductors of their rated size or one of rated size with one or more smaller tap-off wires as small as 8 solid. They can also be easily installed by means of hot line tools. You will note the large contact surfaces of the silicon bronze castings and the large strong Duronze cap screws. They are the reasons for better connections; no loosening of connectors; no overheating or burning of connections; less friction due to strong, but small diameter bolts, hence greater pressures on conductors than for corresponding split bolt sizes; they will cost you up to 50% less than comparable sizes of split bolt connectors.

The **one-piece-to-handle** feature is strongly patented and the name Uniclamp is copyrighted. Use genuine Uniclamps and get all the above advantages.

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MANUFACTURERS and MARKETS

Manufacturers Report Good Year in '48; Optimistic for New Year

Westinghouse Electric Corp produced and sold during 1948 more than 2,500,000 appliances with a factory billing exceeding $150,000,000, J. H. Ashbaugh, vice-president in charge of the electric appliance division, reported in a year-end statement. He stated that the division is beginning the current year with no production cutbacks and added that allocation of merchandise is still prevalent in almost every line. "It is our opinion," Mr Ashbaugh added, "that during the current year we may see the end of allocation of electric home appliances. . . .

"The year-end drop in major appliance sales, about which there has been a great deal of comment, appears as a seasonal decline and is recognized as part of a normal market . . ." Inventories of major appliances now in factory, distributor, and dealer stocks for the peak spring and summer selling periods are lower than at any time in the history of the appliance division, according to Mr Ashbaugh.

Although the electric appliance industry has returned to its historically normal condition characterized by sharp competition, 1949 will be a year of good profit opportunities for dealers who step up their sales efforts to match increasing resistances, Leonard C. Truesdell, vice-president of marketing, Hotpoint, Inc, stated. The industry is as sound as at any time in its history, but the application of proved selling fundamentals, frequently unnecessary in the postwar period, must be resumed to maintain a high level of sales, he said.

Record production in 1948 satisfied the pent-up demand for nearly all major appliances and brought inventories to dealers for the first time since the war. However, electric utility expansion, high employment and wage levels, home building programs, and a growing farm market will combine to create increased markets and keep business good for a long time to come, he said. Another record year for the appliance industry is probable in 1949 in Mr Truesdell's opinion.

Continuing strong demand for aluminum and its products, plus a combination of conditions which prevent adequate increases in production, provoked a tight supply-and-demand situation in the aluminum industry that persisted throughout 1948, said Roy A. Hunt, president of the Aluminum Co of America, in a year-end statement. "It is probable that demand will continue to exceed supply for the early part of 1949 as well," he stated.

"Droughts throughout many areas of North America, coupled with unprecedented industrial and domestic requirements for electric power since the end of World War II, have hampered the aluminum industry for many months, since large amounts of steady electricity are required for aluminum production . . .

"Serious low water conditions in Canadian hydroelectric reservoirs mean that considerably less aluminum for imports into the United States will be available, especially during the early part of 1949.

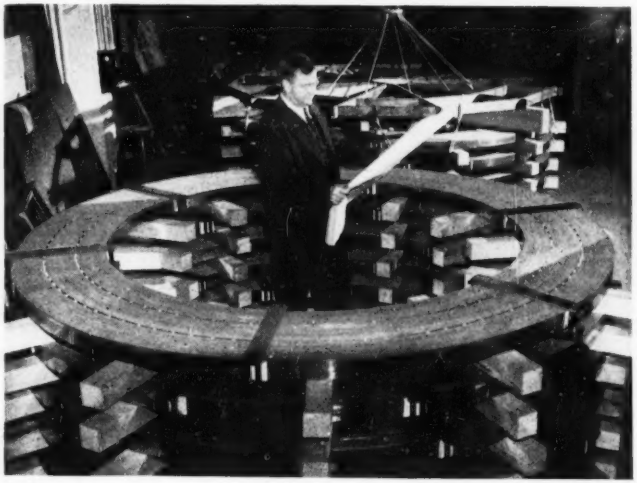
"Another factor limiting aluminum supply in 1949 is that Alcoa's smelting works at Niagara Falls, N. Y., will be permanently closed in February. This will reduce the company's smelting capacity by approximately 40 million lbs a year . . .

"Although the excess of demand over supply in aluminum during 1948 prevented the development of new aluminum applications to the extent that might otherwise have been the case, a number of important advances were made in the technical fields for future development." Mr Hunt said.

•

Foxboro Training Plan

Plans for an enlarged program of instruction, covering the application of correct instrumentation for specific industries in addition to training in the use and maintenance of instruments in general, have been announced by the Foxboro Co, Foxboro, Mass. Each course will include two weeks of study, class work, and shop practice with the various basic types of instruments, followed by three full days devoted to



SUPPLIED BY Revere Copper & Brass Inc, about 10 miles of copper bus bar went into the 17 tons of coils for the University of Washington's new atom-smashing cyclotron. To handle the coil-winding job, a special machine was constructed of war surplus materials on the campus. Shown surrounded by the coils in the University's shop in Seattle is Dr Joseph E. Henderson, chairman of the University's cyclotron committee

A touch of zero in the farmer's kitchen

STRAWBERRIES in December! That's just one small pleasure for the farmer who owns a frozen food unit. More important, it preserves fresh meat and farm-grown vegetables and reduces costly marketing trips for food. Refrigeration for the farm . . . gift of electricity!

With the increasing demand for rural electrification, comes the need for efficient pole-line insulation. Hemingray Power Insulators provide the highly efficient and dependable insulation necessary for medium voltage lines.

No. 670 for 12,000-volt lines. The Technical Standards Committee of the Rural Electrification Administration has approved Hemingray Insulators No. 670, No. 680 and No. 514, under the limits of AIEE Specification No. 41-1944 for use on REA lines.

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American Structural Products Company
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no more worries for me

...now that KOPPERS CREOSOTE is plentiful again!

IF you need creosote for pressure-treating wood, just send an SOS to Koppers, and we'll ship your requirements. And you'll look just as happy as the man above, because you'll get the same high-quality Koppers Creosote you've always known.

When you order Koppers Creosote (or Koppers Creosote-Coal Tar Solutions), it's important to remember that you're getting products that have decades of dependable performance behind them . . . that have established enviable records as wood preservatives everywhere.

Send in your order now. And if you want to *play safe*, ask about Koppers yearly contracts that take care of your future needs.

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For All Types of Wood Preservation

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Silicone News

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Silicone Insulation Gives Rapidly Reversing Motor 10 Times Normal Life

That's significant news to designers of machine tools. Even more significant perhaps to electrical engineers is the further confirmation of our laboratory and motor test results. These tests indicated that Silicone Insulation has 10 times the life and 10 times the wet insulation resistance of Class 'B' insulation under comparable conditions.

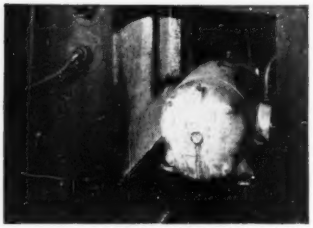

PHOTO COURTESY COGSDILL TWIST DRILL COMPANY

Improved drill grinder depends upon DC Silicone Insulation for long trouble-free operation.

Engineers at Cogsdill Twist Drill Company of Detroit developed a unique machine for grinding drills. Instead of reversing the carriage by a conventional cam or crank, they use a 1 h.p., 1200 r.p.m. motor to reverse the carriage drive 50-60 times per minute.

In this service, Class 'A' insulated motors lasted 3 to 4 days; Class 'B' insulated motors lasted 3 to 5 weeks. After repeated failures, the reversing motors were rewound with DC Silicone Insulation by the A. H. Nimmo Electric Company of Detroit.

The motor bearings were packed with DC 44 Silicone Grease and the frame was painted with DC Silicone enamel. The motors have now been in service over 10 months and show no sign of failure. A hazardous smoke problem caused by the burning of conventional finishes also has been eliminated.

This is a typical example of how Dow Corning Silicone Insulation increases the life and reliability of hard working motors. Specifications for rewinding ac motors are given in data sheet G6AB.

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the special problems of a specific industry. The course began Jan 10.

•

Combustion, Superheater Consolidation Approved

Merger of two well-known power equipment manufacturers, Combustion Engineering Co, Inc, and The Superheater Co, recommended by their directors, (EW Dec 4, p 152) has been consummated by approval of the stockholders of both companies. It became effective on Dec 31, under the new name of Combustion Engineering-Superheater, Inc.

Officers of the new company include Frederic A. Schaff, chairman of the board and vice-chairman of the executive committee; Samuel G. Allen, chairman of the executive committee; Joseph V. Santry, president; Martens H. Isenberg, executive vice-president; Harold H. Berry, vice-president in charge of finance. Vice-Presidents, Wilbur H. Armacost, George D. Ellis, Amaziah J. Moses, John S. Skelly, Otto W. Strauss, Donald S. Walker, Albert C. Weigel, and Arthur Williams.

•

GE Leases Plant to Make Air Force Equipment

General Electric Co has leased from the War Assets Administration the former Remington Rand plant in Johnson City, N. Y., for an expansion of facilities to manufacture special equipment for the Air Force. GE plant engineers are completing plans for putting the plant into operating condition. No major alterations are planned.

Manufacturing is expected to begin within six to nine months when installation of equipment and machinery is completed. It is estimated that peak employment approximately 1,200 will not be reached until sometime in 1950. The plant will be a part of the GE apparatus department.

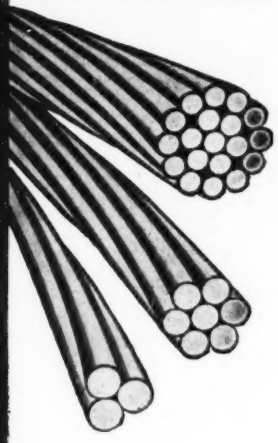
Walter B. Booth of Schenectady will be plant manager.

•

Lincoln Electric Cuts Pay

Lincoln Electric Co, Cleveland, has announced pay cuts of between 2½ and 3% for its 1,089 employees. The announcement stated that the move was made because of a drop in the cost-of-living index of the U. S. Bureau of Labor Statistics. The reductions became effective Jan 1. Only a fortnight before the pay cuts were made, Lincoln workers received a total of $3,821,973 in Christmas bonuses for an average of 104% of their pay.

PAGE
Stainless Steel
STRAND



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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Arizona—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., 30 mi. Coolidge-Electric Dist. No. 5, 115 kv transmission line from Coolidge substation on Phoenix-Tucson No. 1 line to Electric District No. 5 substation on Phoenix-Tucson No. 2 line, Davis Dam Proj., near Eloy.

Arizona-Nevada—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., Blythe Substation 15,000 kva. capacity from 161 kv to 34.5 kv, Davis Dam Project, Arizona-Nevada, about 12 mi. north of Blythe, Calif.

Fla., Jacksonville—City, Electric Power Plant 2, Plan deposit $75, Reynolds, Smith & Hills, 220 Park St., archts.

Idaho—Bureau Reclamation, Dpt. Interior, Boise, 52 mi. single circuit, 3-phase, wood pole, H-frame Goshen to Palisade 115 KV transmission line, southeast of Idaho Falls.

Idaho—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Burley and Rupert, 4 outdoor, power circuit breakers for switchyard at Minidoka Power Plant, Minidoka Proj., Spec. 2519. Plans deposit $1.

Mass., Cambridge—Massachusetts Institute of Technology, 77 Massachusetts Ave., gymnasium and other athletic facilities, **$2,000,000**; mechanical engineering and metallurgical laboratory, **$1,000,000**; laboratory (Biology-Nutritional Biochemistry Food Technology) laboratory housing institutes work in biology, nutritional biochemistry and food technology, **$2,000,000**; hydrodynamics laboratory, **$550,000**; auditorium for lectures and concerts, over **$250,000**; electronic research laboratory for research laboratory of electronics already established but housed in wartime temporary quarters, **$1,100,000**; faculty club, over **$250,000.**

Minn., Fergus Falls—State Dpt. Admin., P. T. Peterson, dir., Purchases, 19 State Capitol, St. Paul, power plant alterations at State Hospital, $100,000, Toltz, King & Day, 1509 Pioneer Bldg., St. Paul, engrs.

N. Y., New York—Bd. Transportation, 250 Hudson St., Zone 13, general building constr. work for 59 Street Power Plant, New York City Transit Sys.

Mo., St. Louis—U. S. Atomic Energy Comm., New York Operations Office, St. Louis Area, 65 Destrehan St., Zone 7, 1 and 2 story, 110x232 ft masonry, steel, factory for Plant 6, 65 Destrehan St., incl. 2 railroad sidings, sub station addn., overhead power lines, etc. Singmaster & Breyer, 65 Destrehan St., Zone 7, archts.

Missouri and Iowa — Nodaway-Worth Electric Co-operative, Maryville, Mo., rural distr. lines, Nodaway, Worth, Gentry, Holt and Harrison Counties, Mo. and Taylor, Page, Ringgold Counties, Ia. **$850,000**, Frank Horton & Co., Lamar, Mo., consult. engrs.

Montana — Bureau Reclamation, Dpt. Interior, Billings, 3.5 mi. 161 kv, wood pole, H-frame, 3 phase, single circuit transmission line between Loma and Fort Benton.

N. Y., Brooklyn—Bd. Transportation, 250 Hudson St., New York, Zone 13, constructing Livonia, Sheepshead and Nostrand substations for New York City Transit Sys.

Okla., Stillwater — City, voted bonds, electric distr. sys. **$290,000**; cooling tower and converting existing electric generators, **$148,000**. George W. Bandeleir, city engr.

South Carolina—Pee Dee Electric Co-operative, Darlington, 261 mi. rural distr. lines, Darlington Co. Approx. **$300,000**. Southern Eng. Co., 699 Spring St. N. W.,

● The new NO-OX-ID Wrap for the protection of lead-sheathed cable against corrosion is a combination coating and wrapper in a roll, is water repellent, guards metal against penetration of calcium hydroxide resulting in manholes where cement-type fireproofing is used. Corrosion-inhibitive qualities provide a dense film, keep cables free from pitting.

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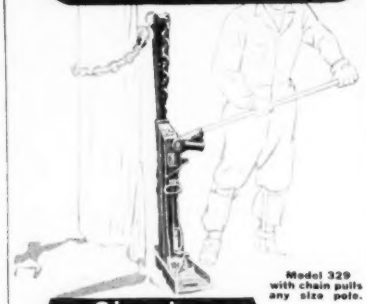

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1046 South Central Avenue
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Atlanta, Ga., consult. engr.

Tex., Roma—International Boundary & Water Comn., U. S. and Mexico, 1st Natl. Bank Bldg., El Paso, Falcon Dam on Rio Grande River (an irrigation and power proj.), sufficient for 600,000 acres land, (water storage sufficient to cover 3,500,000 acres land 1 ft. deep) **$40,000,000.** A. M. Ainsworth, 1st Natl. Bank Bldg., El Paso, and Lloyd McIntosh, c/o Fort McIntosh, Laredo, consult. engrs.

Wyoming—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point f.o.b. cars Thermopolis, outdoor autotransformer; self-cooled outdoor transformers; power circuit breakers; outdoor selector-type switch; outdoor horn-gap switches; outdoor disconnecting switches; hook-operated, outdoor expulsion-type disconnecting fuses; outdoor, station-type thyrite or autovalve lightning arresters for Thermopolis Substation, Transmission Lines Unit, Missouri River Basin Proj. Spec. 2526; completing Kortes Power Plant and switchyard, installing three 18,500 hp. turbines; three 50,000 ft. lb. governors and three 13,333 kva. generators, erecting 5 steel transmision towers and stringing conductors for approx. 1 mi. transmission line, Missouri River Basin and Kendrick Projs.; furnishing, del. f.o.b. cars shipping point or f.o.b. cars Emery or Bonneville, outdoor power circuit breakers; outdoor selector-type switch; manually and hook-operated outdoor disconnecting switches; outdoor horn-gap switch, for Boysen Switchyard, Boysen Unit, Missouri River Basin Proj., Spec. 2527; Medicine Bow substation, 4,000 kva capacity, from 115 kv to 34.5 kv and 2.4 kv., incl. constructing concrete footings, furnishing, erecting, chain-link fence, erecting steel towers, installing electrical equip., furnishing, placing gravel surface, Medicine Bow.

Low Bidders & Contracts Awarded

Alabama—Pioneer Electric Co-operative, Greenville, 300 mi. rural distr. line and other sys. improvs., Butler Co., etc., force acct., **$675,000.** Mowbray Eng. Co., Greenville, engr.

N. Y., Brooklyn—Bd. Transportation, 250 Hudson St., New York, Zone 13, Contr. 9, electrical work for East New York Bus Depot, from Jandous Electric Constr. Corp. and Hoffman & Ellas, Inc., 254 W. 31 St., New York, Zone 1, **$898,648.**

Washington—Bonneville Power Admin., 729 N.E. Oregon St., Portland, Ore., Dec. 15, 19.42 mi. Scenic-Index Sect. Foster Creek-Snohomish 230 kv. transmission line, King and Snohomish Counties, Inv. 4407, from Parker-Schram Co., Builders Exchange Bldg., Portland, Ore., **$722,871.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ark., Little Rock—Pub. Bldgs. Admin., 18 and F Sts., N. W., Wash. 25, D. C., office, **$5,500,000.**

Conn., West Haven—U. S. Eng., 75 Federal St., Boston, Mass., plans by Curtin & Riley, 45 Newbury St., Boston, Mass., brick, steel, 400-bed tuberculosis unit and 500-bed medical-surgical unit hospital, Campbell Ave., **$15,000,000.**

Fla., Gainesville—State Bd. Control, Tallahassee, plans by Guy Fulton, archt., State Bd. Control, and Kemp, Bunch & Jackson, Florida Theatre Bldg., Jacksonville, student dormitories, **$1,628,000.**

O., Ashtabula—National Distillers Products Corp., 120 Broadway, New York, N. Y., chemical plant mfg. metallic sodium and chlorine, In State Road industrial area, **$10,000,000.**

Low Bidders & Contracts Awarded

D. C., Wash.—District Govt., District Bldg., Jan. 4, 2 story, 24 classroom Walker-Jones Elementary School, 1 and I Sts., N.W., from F. L. Daniels, 2112 N. Quincy St., Arlington, Va., **$642,632.**

Ill., Bellwood—Chicago Screw Co., 1026 S. Homan St., 1 and 2 story, brick, concrete, steel factory, office waterhouse, etc., to George Sollitt Constr. Co., 109 N. Dearborn St., Est. **$4,000,000.**

Ore., Portland—Multnomah Co., Courthouse, Dec. 30, juvenile home, from L. H. Hoffman, 715 S.W. Columbia St., **$1,073,573.**

RECENT RATE CHANGES

NEW YORK POWER & LIGHT CORP and Central New York Power Corp, two of the operating companies of the Niagara Hudson System, will reduce electric rates to residential and commercial consumers by $1,000,000 on an annual basis. Niagara Hudson officials have indicated that they will file promptly revised tariff schedules and the effective date of the reduction will be announced by the commission shortly. Agreement for the reduction stems from the recent proceeding in which the commission has approved the consolidation of the three principal divisions of the Niagara Hudson System—New York Power & Light, Central New York Power, and Buffalo Niagara Electric Corp—into a single operating company. Of the $1,000,000 reduction by New York Power & Light and Central New York Power companies, $630,000 will go to residential consumers and $370,000 will accrue to the benefit of commercial users. The territory of the two companies is divided into three areas: (1) large cities, including Albany and other sizable urban communities in the capital district and Syracuse and Utica; (2) smaller cities, including Amsterdam, Saratoga Springs, Rome, Oswego, Fulton, Oneida, Watertown, and Cortland and (3) rural areas. In the large and smaller cities, the present minimum monthly charge of 75 cents in the residential classification, with 15 kwhr allowed in the minimum cost, will remain unchanged. In the follow-on block (residential) in the large cities, the present rate of 4 cents per kwhr will be reduced to 3.75 cents and in the smaller cities the present rate of 4.3 cents per kwhr will be reduced to 3.9 cents. In the rural areas, the monthly minimum charge of 90 cents per month with 15 kwhr included in the minimum will be retained, but the follow-on block after the minimum, which under present rates is 4.6 cents per kwhr, will be reduced to 4.2 cents. In the commercial classification, the present minimum monthly charge is 75 cents with 10 kwhr allowed in the minimum cost. The minimum charge of 75 cents will be retained, but the amount of electricity allowed will be increased from 10 to 12 kwhr. The follow-on block in this classification is now 5.6 cents per kwhr and will be reduced so as to absorb the $370,000 earmarked for commercial consumers.

BUFFALO NIAGARA ELECTRIC CORP has been authorized to eliminate from its tariff schedules a flat electric rate for water heating in Niagara Falls and Medina, the New York Public Service Commission having affirmed a previous decision covering the authorization. An opinion by Commissioner Maurice C. Burritt points out that this low rate applicable only in the Niagara Falls and Medina areas results in wasteful use of electricity and is unjustly discriminatory against consumers in the balance of the company's territory. This rate covers an unmetered service for water heating permitting customers to use unlimited quantities of energy at a rate which comes to about a half-cent per kwhr. About 10,000 customers make use of this service in the Niagara Falls and Medina areas. Customers in the rest of the company's territory pay at least 1½ cents per kwhr for this service. If all present customers in the Niagara Falls and Medina area continue to use water heating service under the rate in effect in other parts of the company's territory, it

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will result in a revenue increase the effect of which cannot now be estimated, according to Commissioner Burritt's opinion, but it may range between $100,000 and $250,000 on an annual basis. In its filing the company did not claim that it needs the additional revenue, but stated that its principal objective was to prevent the waste of electric power. Customers under the unmetered service, municipal officials and various organizations in Niagara Falls protested against discontinuance of the flat rate.

SAVANNAH (GA.) ELECTRIC & POWER Co's application for rate increases (EW Nov 20, p. 156) has been granted by the state public Service Commission. The increases will give the utility $340,721 additional gross and a net of $197,091 after taxes on the increased revenue. The commission recognized that the rate of return for the company had dropped from 6.01% to 4.2% and that a fair return of at least 6% should be obtained. The new rates will give the company a return of 6.47% on a rate base of $11,252,921, which includes construction work now in progress. The company proposed an increase of 30% in water heating rates for all energy in excess of 60 kwhr per month or a 24.6% overall increase in revenue from water heating. This was denied since residential and commercial rates were increased. There were 73 customers on a combined commercial and power rate which had been frozen. These were eliminated and placed on regular schedules.

CENTRAL MAINE POWER Co's industrial rates, effective last summer, have been approved by the state Public Utilities Commission. A protest of the Goodall-Sanford Co. Sanford, was rejected with the comment that no evidence and only a general statement of objections had been presented to the board at a recent hearing.

MAINE PUBLIC UTILITIES COMMISSION has been asked by six distributors of electrical energy in Aroostook County to approve rate increases aggregating $112,000 a year in new revenue. These companies purchase energy from the Maine Public Service Co, Presque Isle, whose wholesale rates are up about 30%. Increases would average about $1.25 per month per customer. The petitioners are the Houlton Water Co, seeking 25% increase; Mars Hill Electric Co, 12; Fort Fairfield Light & Power Co, 14; Limestone Electric Co, 12; Van Buren Light & Power District, 16; and Farmers Electric Co, Easton, 25%.

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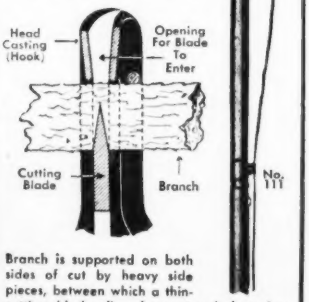

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CATALOGS • BULLETINS

● LIGHTING: A 4-page leaflet describes a remote control system for use with Slimline fluorescent lamps. Wheeler Insulated Wire Co, Inc. 378 Washington St. Bridgeport 4, Conn.

● MERCURY SWITCHES: A 16-page manual presents design information, engineering data and chart on selection for specific electrical applications. Minneapolis-Honeywell Regulator Co. 2753 Fourth Ave South, Minneapolis 8, Minn.

● SPEED CONTROL: New 20-page booklet, 4400-TEC-1078, entitled *Precision Speed Control for Boiler Draft Fans with the Regutron Controlled Magnetic Drive*, discusses principles of operation with graphs, diagrams, and installation pictures. Electric Machinery Mfg Co. Minneapolis, Minn.

● OHMMETER: An illstrated 12-page bulletin 24-25 on the "Ducter" low resistance ohmmeter contains wiring diagrams and charts illustrating text on aspects of low resistance testing, and its application. James G. Biddle Co. 1316 Arch St. Philadelphia 7, Pa.

● POWER LINE DEVICES: Solderless connectors, clamps, splices and sleeves, deadends, grips, telephone protective equipment are items described and illustrated in a sectionalized catalog. Reliable Electric Co. 3145 Carroll Ave. Chicago 12, Ill.

● MAGNETS: An 8-page bulletin CDM-12 describes cast and sintered Alnico, Cunife, Cunico, Vectolite, Silmanal and various permanent magnet holding assemblies, also special alloys Thermistors and Hevimet. General Electric Co. Chemical Dept. Pittsfield, Mass.

● LAMPS: Bulletin 68 carries description, specifications and illustrations for industrial lamps such as R40 floodlights, R40 infrared lamps, spatterproof lamps and weatherproof lamps made of special glass so they can be used without protective fixtures. Radiant Lamp Corp. 300 Jelliff Ave, Newark 8, N. J.

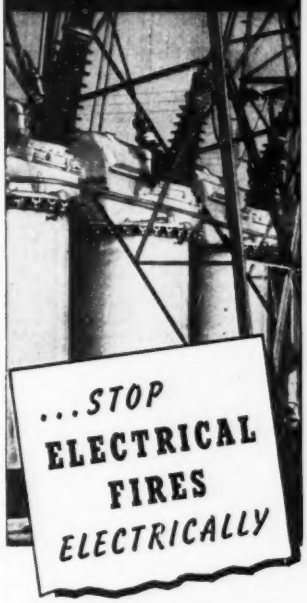
● MAGNETIC SEPARATORS: In catalog 12 permanent non-electric magnetic separators are described and weights, sizes and strength comparisons listed. Eriez Mfg Co, 114 East 12th St, Erie, Pa.

● ELEVATOR: An 8-page catalog 200-D-6A gives mechanical details of a portable material elevator which is self-erecting to 47 ft. American Hoist & Derrick Co, 63 South Robert St, St. Paul 1, Minn.

● ELECTRODES: For arc welding electrodes a 40-page catalog contains a selector chart, general description, welding procedure, mechanical properties and specifications. Wilson Welder & Metals Co Inc, 60 East 42nd St. New York 17, N. Y.

● TRANSFORMERS: Bulletin 1110 describes, gives applications, design and construction of standard dry type transformers up to 100 kva for single and 3-phase, 120 to 600 v. Lindberg Engineering Co. 2443 West Hubbard St, Chicago 12, Ill.

BLAW-KNOX
FIRE PROTECTION SYSTEMS



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LETTERS TO THE EDITOR

Velox Boilers

To the Editor of ELECTRICAL WORLD:

In the *Brown Boveri Review* for January/February 1948 the remarks appearing on page 5 do not single out the Velox Boiler as a unit which is particularly or more sensitive to fuel oil with high ash content than the normal water tube boiler, as implied in the *Technical Notes* item on page 20 of the December 11, 1948, issue of ELECTRICAL WORLD.

On the contrary, these comments indicate that it is easier to cope with this problem in the case of Velox Boilers.

This of course, produces quite a different impression on the casual reader: it is clearly a statement which practically reverses itself when it is taken out of the context.

It may of course, be argued that the readers who are really experienced in boiler matters will immediately realize that such problems are very serious in normal boilers and may thus not take this statement as a disadvantage peculiar to the Velox Boiler.

On the other hand, I believe that the large majority of the readers of ELECTRICAL WORLD, especially of the *News Issue*, are not to be classified as boiler experts and to them these comments must therefore, mean that you have described a drawback or shortcoming of the Velox Boiler.

I am sure that you will agree, when comparing the note in the *Brown Boveri Review* with your excerpt or condensed form, that the meaning is quite different in the two, and I wonder therefore, if you might be prepared to insert another note in one of the next *News Issues* which will correct the wrong impressions which I am sure have been created.

Paul R. Sidler, President
Brown Boveri Corp

(*Editor's Note:* Mr. Sidler is quite right in asking that the reader put more emphasis on the ease with which the characteristic water-soluble deposits can be removed.)

Defining the Invisible

To the Editor of ELECTRICAL WORLD:

Perhaps there would be a place for this communication among the letters that you print in your periodical. The purpose of my writing is to ask your readers if any of them would care to share with me an activity with which I am much concerned. This activity consists of finding situations and language familiar to us in the 20th Century, that will interpret the parables and imagery of the Bible. Thus, electricity, itself invisible, might be a fruitful source of illustrations of the workings of God, Who is also invisible.

Then, substations, transformers, relays and all the other things with which we are so familiar in this electrical age, become aids to us in perceiving and understanding our relationship to the things of the Spirit. Most of us would have some difficulty in comprehending the poetically beautiful passage that opens the 15th chapter of the Gospel of John, in which Jesus speaks of himself as "the true vine," God as "the husbandman," and his followers as "the branches." But the light of comprehension would begin to burn if we say that God is the generator, Christ the transmission line, and we the motors and other appliances utilizing the power provided for us.

If such comparisons can be made and publicized, our generation may regain an insight into the teachings of the Bible. Those who are able to obtain this insight will welcome the guidance of these teachings in meeting the stresses of the bewildering times in which we live. The illustrations that come to me will be publicized as widely as the available facilities permit. Any of your readers who have comparisons to offer, are requested to send them to me in care of the Edward Johnson Foundation, Inc. Box 238, Berkeley 1, Cal.

This Foundation derives its name from my missionary great-grandfather, Edward Johnson, who arrived in the Hawaiian Islands in 1837, where his work was centered until his death in 1867. The axe and pruning hook in the Foundation's seal were suggested by the opening verses of the previously mentioned passage from John 15.

As a means of giving you my background for this interest in interpreting the Bible to the 20th Century, I am inclosing a reprint of one of the reviews of the book of Scriptural passages, *Prove All Things*, that I compiled. I shall make the best use in my power of any new material that comes to me through your cooperation.

Henry M. Bindt
Executive Secretary

(*Editor's Note:* Most of the rules of publishing would dictate that the letter above be filed promptly—in the circular file which stands by every desk. We prefer to file it in this fashion. For one thing, we're certain that even electrical engineers do not live by science alone. For a second, if any reader of ELECTRICAL WORLD can make the slightest contribution to such a cause as is set forth here, we think it would be wrong to deny him the opportunity through failing to make him aware of the opportunity.)

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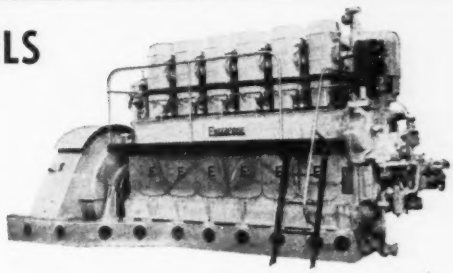

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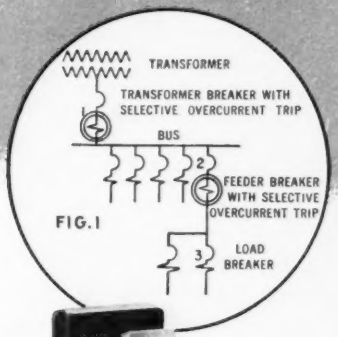

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Now, through the use of I-T-E's *direct-acting* Selective Overcurrent Trip Device, originated by I-T-E engineers, Selective Tripping has reached a new high in effectiveness and dependability. Through its direct action, the Device is more reliable because it eliminates the need for control circuits and costly auxiliary control equipment. Being mounted right on the breaker, it is space-saving, readily accessible, and economical to maintain.

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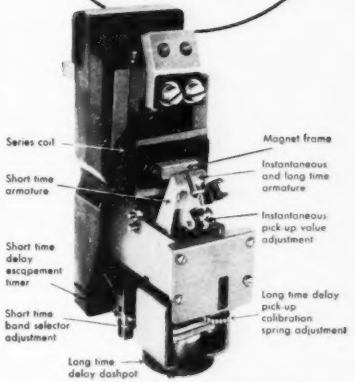
Series coil
Short time armature
Short time delay escapement timer
Short time band selector adjustment
Long time delay dashpot
Magnet frame
Instantaneous and long time armature
Instantaneous pick-up value adjustment
Long time delay pick-up calibration spring adjustment

I-T-E SELECTIVE OVERCURRENT TRIP DEVICE ©
(Elementary type used for purposes of operation explanation only)

TYPICAL OPERATION

This device operates through a series coil with two clapper-type armatures mounted side by side. One armature is connected to a long-time delay and has a pick-up point of 80–160%. This long-time armature is connected to its timer through a calibrated spring which permits instantaneous tripping when the current reaches a predetermined value above 1200%. The second armature is connected to a short-time delay escapement mechanism, and has a pick-up value of 800–1200% of the rated coil current. In operation, both armatures start moving at the current values for which they are calibrated. Thus, if the current is above instantaneous value, both timers start moving, but precedence in tripping is obtained by the instantaneous armature due to the yield of the calibrated spring. If the current is in the short-time range, both armatures move, but the short-time armature trips the breaker before the long-time armature has moved very much. The difference in the short-time tripping ranges of the breakers in the system is so arranged that the breaker farthest from the source of power trips first.

For a complete technical explanation of Selective Tripping, write for Bulletin 4802, SELECTIVE TRIPPING OF LOW VOLTAGE AIR CIRCUIT BREAKERS.

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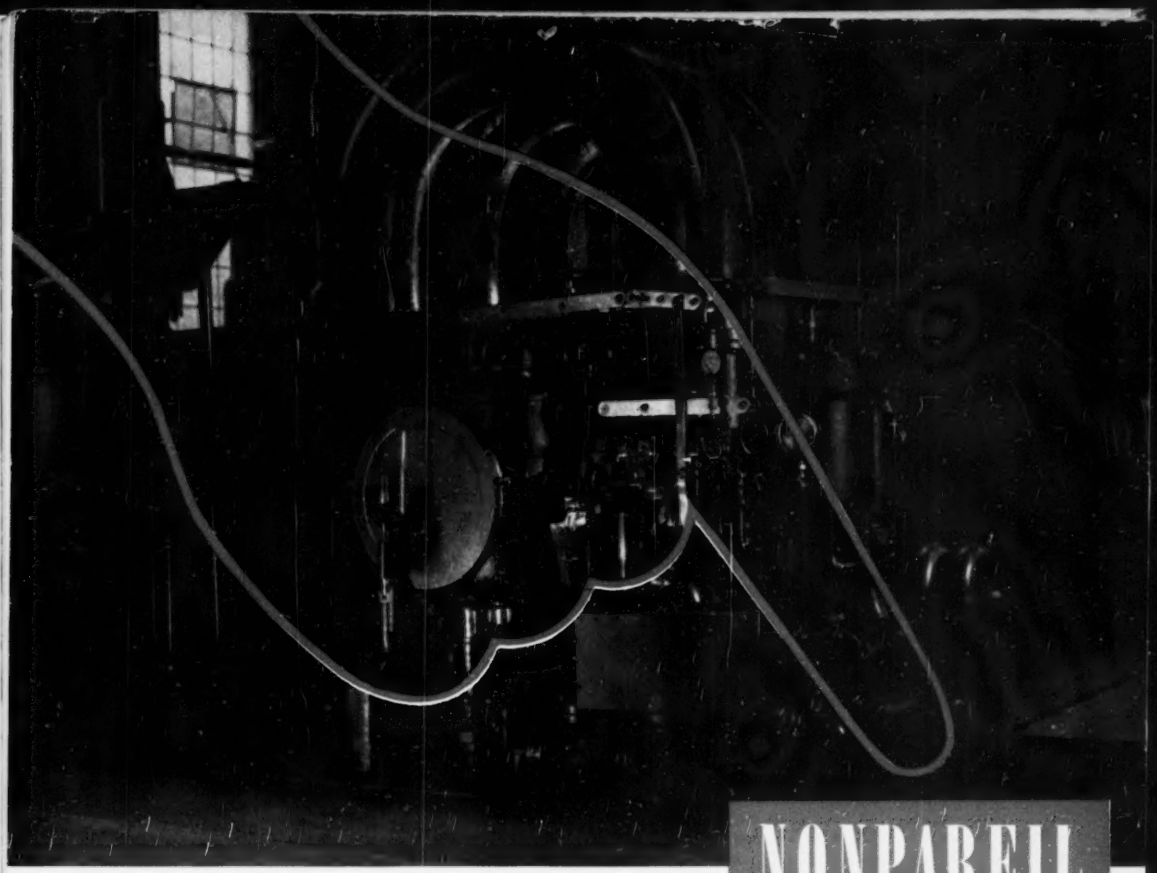

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